No. 1847
Vol. XLV

FILES

FLIGHT

and

The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

MAY 18th, 1944

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FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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The Outlook

Our New Transports

OF the statements made by Lord Beaverbrook in the air debate in the House of Lords last week, the one which gives *Flight* the greatest satisfaction is the announcement of the Short Shetland. As our readers will be well aware, we have been preaching the gospel of the flying boat in season and out for a great many years, and the stony silence maintained, so far as Government spokesmen were concerned, on the important subject of flying boats has recently caused considerable anxiety. That Lord Beaverbrook should have announced that there *is* a flying boat on the way was welcome. Even more welcome was the statement that it is likely to fly within a few weeks. That, in our view, is far more important than the fact that the machine is not yet in production.

The building of a prototype, and especially one as large as the Shetland must obviously be, is a lengthy business. Many of the parts have to be "hand-made," and evidently during the war the number of people who can be put on to the work must be limited, both in the drawing office and in the works. But the very fact that Shorts have been able to get the machine within a few weeks of flying augurs well for the future—not too distant one hopes—when a proper production line can be started.

No data relating to the Shetland have been officially released in this country, but some time ago an Australian journal, the *Air Log*, conjectured that the Shetland will be in the 100-ton class, with a range of 3,000 miles and a cruising speed of 275 m.p.h. Our contemporary believes that "like the Bristol Brabazon it will have Centaurus engines—but only four of them."

Without taking our contemporary's guesses too seriously, this brief specification does not sound too unreasonable. We should have thought 275 m.p.h. cruising speed a bit optimistic with four engines and 100 tons gross weight, but even something a good deal less than that would be very useful on many long-distance air routes.

As to what the Handley Page civil version of the Halifax may be one can only guess. When the wing span was increased, in the Mark III, and Hercules engines fitted, there was a considerable increase in top speed and ceiling, so it is logical to assume that these features will be retained. The "commercial" fuselage, although it will probably be of greater cross-sectional area than that of the Halifax, may be expected to be of better aerodynamic shape, so that the performance should be good.

The old H.P.42 (Hannibal class) in its day set a new standard in passenger comfort. It is a foregone conclusion that the new Handley Page civil machine will uphold that tradition. That would scarcely be possible without a pressure cabin, and so one may safely assume that this very necessary aid to flying comfort will be incorporated in the design.

Lord Beaverbrook's confirmation of the fact that De Havillands are to build one of the new civil types will cause general satisfaction. The De Havilland firm have always been specialists in commercial aircraft, so it was logical that there should be at least one D.H. type in the post-war programme. One may, perhaps, venture the guess that, since engines in the high-power class are already available from other firms, De Havillands will use their own engines. Some months ago it was announced that the firm has modernised the Gipsy Six and fitted it with a supercharger, so the logical deduction is that this type of engine, or a development of it, will be fitted. In view of the relatively low power, it would

seem likely that four such engines will be used in the new machine.

Lord Beaverbrook said the machine might fly in about a year. Judging by the Mosquito, that seems probable.

The Lords' Debate

A WELL-KNOWN writer on aviation subjects once confessed that his greatest trouble was that he could not write about anything in less than 2,000 words. Last week the House of Lords debated civil aviation in millions of words, but it cannot truthfully be said that the result was in any way commensurate with the volume of verbiage.

"Chosen instruments," cabotage, freedom of innocent passage, American views and the international conference, the position of shipping and railway companies, private flying and many other aspects were examined from many different angles without anyone being very much wiser than before.

Viscount Trenchard, with that persistence which enabled him for years to hold his own against the Admiralty, insisted on being told whether the right to fly over an all-red route meant flying in a straight line over other countries. The question was certainly pertinent, for did not Imperial Airways once have to send their passengers by rail over certain routes?

There was a deadlock between the spokesmen for the shipping companies and railways on the one hand, and Lord Beaverbrook on the other. Surface transport wanted to know the Government's policy, the Lord Privy Seal thought the companies should lay their plans before the Government.

That inevitably led to a debate about competition with B.O.A.C., the only company to hold a monopoly of subsidies. If the shipping and railway companies were to pick their routes with a view to commercial profits, leaving the "chosen instrument" to cover less remunerative routes, these companies would obviously be adding to the burdens of B.O.A.C., thus increasing its need for larger subsidies.

The shipping companies do appear to have a reasonable claim to being "in the picture" after the war. Their interests lie mainly in long-distance routes, and their existing facilities for handling traffic in many parts of the globe could, with adaptations and innovations, be extended to include air transport, more especially by flying boat. In the case of the railways the claim to inclusion in the air picture is less obvious. Except for a comparatively few services extending to the Continent of Europe, the railways did not in peacetime operate outside the boundaries of the United Kingdom, and Lord Kennett's touching picture of what the railways would do, quite unselfishly and solely with the public good in view, if admitted to post-war air transport, was not very convincing.

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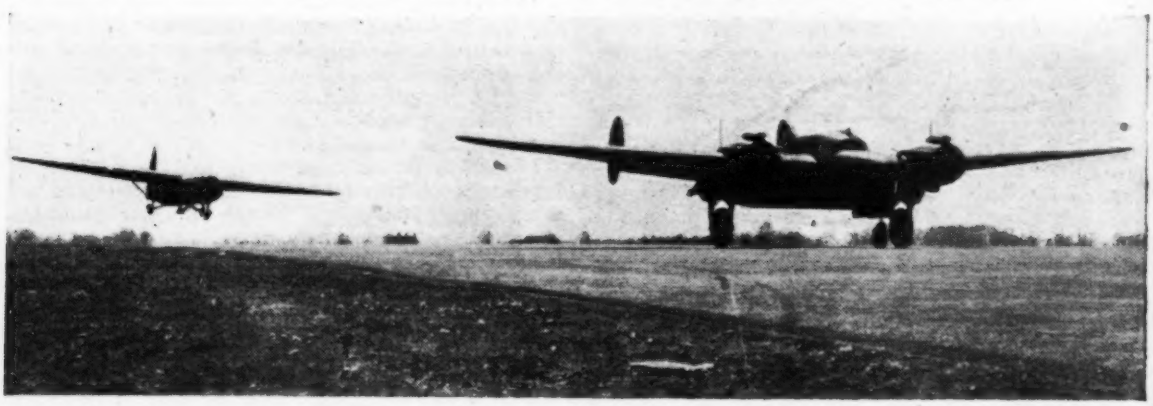
Results

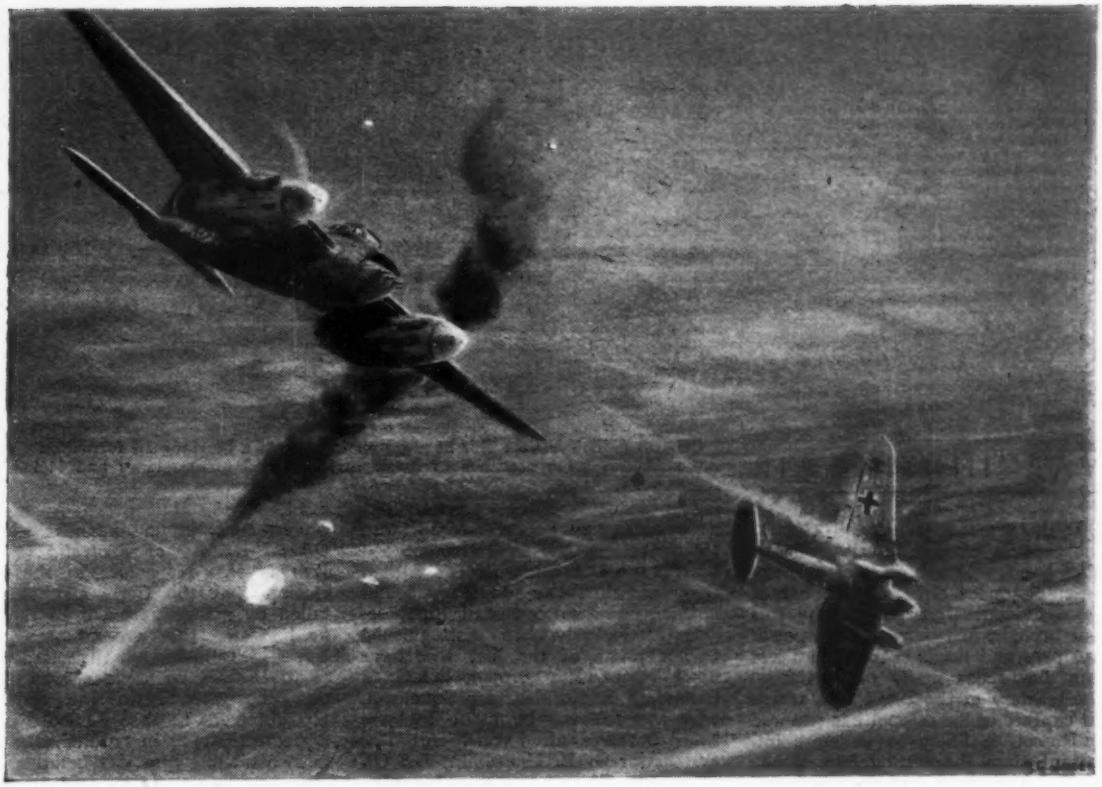
IN spite of the meandering nature of much of this debate, a few concrete facts did emerge. In connection with the recent Anglo-American talks, Lord Beaverbrook threw some light on what was evidently in his mind at the Press conference when he stated that Britain had had to make concessions. It now appears that on our side we were prepared to subscribe to what has been termed the Canadian Draft Convention, which went into great detail concerning international control. Mr. Berle, on behalf of America, wanted something more elastic, and the principles agreed upon at the Imperial Conference last October were found acceptable.

America's promise, made by Mr. Berle, that aircraft will be made available to us after the war on a non-discriminatory basis was another reassuring fact.

Lord Beaverbrook's statement that the United States and Great Britain are in agreement on the broad principle that there must be control of subsidies and of international standards, as well as an elimination of uneconomic competition and an equitable participation in world air transport, indicates that although the forthcoming international conference will have many problems to solve, there is no disagreement on basic principles.



AIRBORNE OPS.: An Armstrong Whitworth Albemarle tows off an Airspeed Horsa glider. The glider has a lower wing loading than the tug aircraft and therefore takes off first.



An impression, by R. G. Jones, of the occasion when Wing-Cdr. G. A. Goodman, D.F.C., and his observer F/O. W. F. Thomas shot down four Heinkel IIIs in six minutes. They were flying an A.D.G.B. fighter Mosquito.

WAR in the AIR

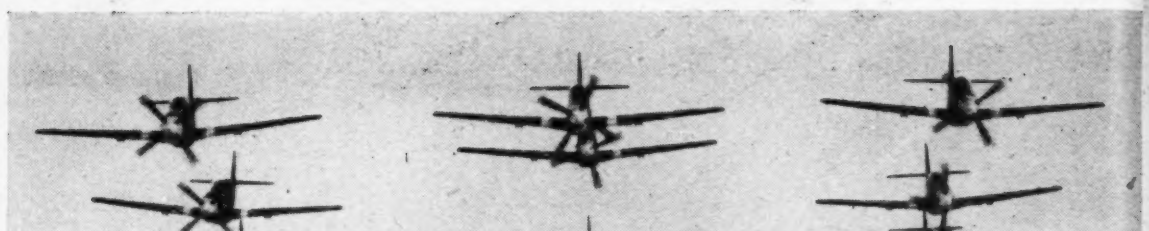
Combined Operation at Sevastopol : Softening Process in the West : Tank-busters in Burma

WHETHER the Russians succeeded in mystifying the Germans about their intentions or not, they certainly made many correspondents in Russia as well as observers elsewhere believe that they did not intend to incur the loss of life which would be entailed by the storming of Sevastopol. There seemed no obvious reason why they should, as the place could not be relieved by the Germans and must, sooner or later, fall into their hands. So they used their artillery and aircraft together to keep up a perpetual battering of the defences, while the Black Sea Fleet and its aircraft took heavy toll of the German shipping which tried to get away to Rumanian ports.

However, in the end the Russians did storm the fortress, and captured it after three days of furious fighting. The final blow was, of course, dealt by the Russian infantry; but the victory has been hailed as a combined operation by all three Services, and the names of the Chief of Staff, the senior Air Marshal (which is the British translation of some Russian rank in the Red Air Service), and the commander of the Black Sea Fleet were all mentioned in Marshal Stalin's Order of the Day. It is, so far as we remember, the first victory in which all three Russian Services have been equally honoured.

The Germans claim that while Sevastopol was holding out the delay gave time for the strengthening of their defences elsewhere.

WEST WALL GAME : Paratroopers fitting containers of special equipment to the wing racks of a Dakota.



QUADS AND TWINS : This head-on photograph of a Mustang III formation gives the aircraft an appearance of queer multi-engined quadruplanes and biplanes.

WAR IN THE AIR

especially around Lvov and Galatz. The capture of this fortress, on the other hand, sets free a Russian Army for employment elsewhere, though it seems evident that Russia has this year brought her enormous sea-power into play and needs extra armies less than she needs many other things. The mastery of the Black Sea, which the capture of Sevastopol has restored to Russia, is likely to be more important than the setting free of one Army. The air arm of the Black Sea Fleet has made a name for itself and has seized every opportunity of making its power felt. Its opportunities will now be increased.

Behind the Lines

ALL through last week the Air Forces of the United Nations have been striking at the back areas of Hitler's "fortress of Europe," from the West, from the Mediterranean, and from the Russian front. The numbers of aircraft employed have been prodigious, and the fine weather which mostly prevailed gave opportunities for great accuracy in bombing the many targets. This was very fortunate, for many of those targets were in occupied territory, and the aircrews were warned to take meticulous care that their bombs should fall in the target areas and not kill Frenchmen, Belgians, or Dutchmen if that could possibly be avoided.

It is reported from the South-East Asia Command that Allied air co-operation with the troops has been one of the outstanding features of the battles in Burma. The "tank-buster" aircraft has made its appearance there, and one cheerful story tells how some of these formidable machines chased two Japanese tanks for a mile and a half along a road until the latter were finally destroyed. No less pleasing is the tale of some Mitchell medium bombers which were flying home with some bombs left in their racks. They passed over a British post and signalled, "Any job for us to do?" They were told that a Japanese battalion was forming up not far off, so they went and bombed it, and when the British and Indian troops reached the spot they found nothing but dead bodies of Japanese.

Quite recently two distinguished fighter pilots of the last war have died:—Capt. Roy Brown, D.S.C., a Canadian, late of No. 209 Squadron, who was believed by many to have killed Baron Manfred von Richthofen, and Major G. B. McCubbin, D.S.O., a gallant South African pilot, who was credited with having shot down Max Immelmann. There have been discussions and disagreements about both these feats. The official history of *The War in the Air*, by H. A. Jones, accepts the theory that Brown killed von Richthofen on April 22nd, 1918, but the Australian Government, in an appendix to the *Official History of Australia in the War of* 1914-18, comes to the conclusion that the German pilot was killed by a bullet from a Lewis gun fired from the ground by Sgt. Popkin. Immelmann, the noted pilot of the Fokker monoplane, was killed on June 18th, 1916, and 2nd Lt. McCubbin (as he then was) of No. 25 Squadron, flying in an F.E.2B., had been attacking him just before. The Germans, however, thought it more likely that something was wrong with Immelmann's interceptor gear (which had been giving him trouble on recent days), and that his gun shot off his own airscrew. The vibration, they say, then caused the Fokker to break in two in the air.

AIR BASE STRAFE : A Mitchell of the U.S. 7th A.A.F., low-bombing Japanese runways on Taroa Islands in the Marshalls. From this height the Americans usually employ parachute bombs.

WAR IN THE AIR

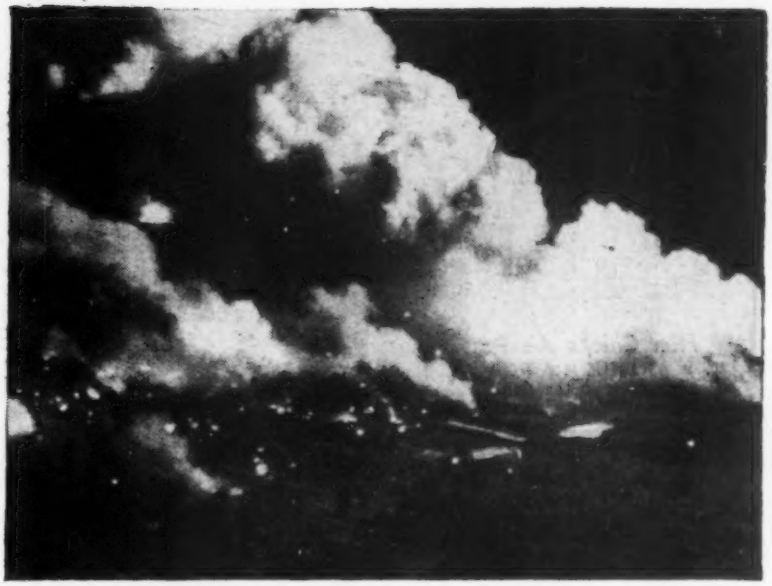
Offensive in Italy

THE tension and the accompanying stand-still on all the main fronts was broken last week by a full-scale attack by the armies under Gen. Alexander in Italy. The General started by sending aircraft to blow up the Pescara dam, and the flood which ensued gave so much protection to the right wing of the 8th Army that it was possible to transfer troops from that front to strengthen the 5th Army on the left of the Allied line. This was a really clever use of aircraft in land fighting. Then the full power of the air was turned on to interfering with communications behind the enemy's lines. In particular the Avisio viaduct on the line running south from the Brenner Pass was breached. Generally speaking, it is rather extravagant to use aircraft to break railway bridges. The bridges make difficult targets, and German engineers are very clever at repairing the damage in a short time. But when a major attack is in progress the delay of even a short time on an important line of communications may have telling results.

Nearer to the front the Germans must find it extremely hazardous to move along the roads by day, with Allied bombers swarming all over the country and attacking everything that seems a likely target. None the less, the Germans have shown themselves adepts at getting reinforcements and supplies through by night. The Allied air attacks have hampered, not paralysed, these movements.

Over the actual battlefield there is only one side in the air. The *Luftwaffe* hardly ever puts in an appearance. Last Saturday night it sent 20 bombers to Naples. They dropped bombs, but lost three of their number to the guns of Allied night-fighters. It was not an impressive effort. The fighter-bombers and light bombers of the Allies range where they will, and attack enemy positions. Now and again they knock out a German gun, or do other damage, which helps the harassed infantry on that particular bit of front. But the Germans do not seem perturbed by the Allied air supremacy. They trust to the mountains to protect their troops from bombing and machine-gunning on a scale which proved so effective in Africa; and the fortifications which they have erected are admitted to call for strenuous efforts and determination from the assaulting troops.

This offensive in Italy is obviously meant to play a particular part in the wider strategic plans of the Allies. The enemy cannot reinforce in Italy without weakening some other front, and likewise he cannot use his troops there as a reserve for meeting the coming invasion in the West. It is to the West that his eyes are turned; while he must also be prepared to meet other landings in the Mediterranean. Command of the sea gives the Allies many choices of action.



UP IN SMOKE: Terrific explosions occurring during a night raid by Lancasters on an ammunition dump at Sable-sur-Sarthe, near Le Mans.

DEATH OF A. L. WYKES

IT is with very great regret that *Flight* records the death of Mr. A. L. Wykes, managing director of Taylorcraft Aeroplanes (England), Ltd., who was killed on Sunday last whilst flying an Auster in aid of Leicester's "Salute the Soldier" week. He was giving a display of aerobatics and, according to eye-witnesses, it would appear that the machine dived into the ground from a height of only about 300ft. At the time of going to press the cause of the accident has not been ascertained.

Mr. Wykes, who was 45 years of age and leaves a widow and young son, served as a pilot in the last war. He was a great enthusiast for the light aircraft and regarded the Auster type as ideal for the post-war owner-pilot and for flying clubs.

MOSQUITO CREATES ATLANTIC RECORD

THE shore-to-shore Atlantic record between Labrador and Britain was lowered to 5hr. 40 min. last week-end by one of the first two Canadian-built Mosquitoes to fly non-stop to this country on the R.A.F. Transport Command's route; time from take-off at Goose Bay to an inland base in Britain was 6hr. 46min. Wing Cdr. J. de L. Wooldridge, who piloted the aircraft, was making his first trans-Atlantic flight. He had previously been in command of a Mosquito squadron in this country, and at the termination of a duty visit to America volunteered to ferry a Mosquito back to Britain. The second was but little slower.

The previous best time for the Labrador-Britain route was made by Capt. W. L. Stewart, of B.O.A.C., flying a Liberator. The Mosquito improved on this by 2hr. 10min., and was also 30min. quicker than the record held for a year by Capt. G. R. Burton, who flew a Liberator over the 120 miles shorter route from Newfoundland in 7hr. 16min.

HERE AND THERE

Film Chief's Air Post

MR. J. ARTHUR RANK, one of the leading men in the British film industry, has accepted an invitation to become honorary treasurer of the Air League of the British Empire.

French Civil Air Plan

M. FERNAND GRENIER, commissioner for air in the French National Committee, recently stated, in Algiers, that a vast plan was afoot to link up the French Empire with airlines covering 37,500 miles. It was hoped, he said, to extend existing lines through Africa to Madagascar, Corsica and Moscow, covering some 280,000 miles a month.

R.A.F. Salvage

IN less than three years the R.A.F. has collected 276,778 tons of material and either reused or returned it to industry. By sorting salvage at its source they have saved over £135,000 of the taxpayer's money, for the salvaged material ranged from aluminium and transparent plastics to waste paper and bottles and is classified in 124 categories.

Post-war Glut

"AFTER the war Britain will be trying to sell aircraft to a world knee-deep in 'planes," said Sir Richard Fairey, addressing a Board of Trade meeting in Vancouver recently, and added that the British aircraft industry could turn out enough aircraft in three days to last all the world's commercial airlines for five years.

An Up-and-Down Life !

LT. COL. N. A. AMINTAEV, of the Red Air Force, recently made 53 parachute jumps in one day while training instructors, says a Moscow message.

He has been training parachutists for twelve years and has made more than 1,400 jumps in all, in addition to turning out more than 2,000 instructors with more than 100 jumps each.

U.S. "Jet" Fighter

SOME weeks ago we quoted an American report that squadrons of jet-propelled fighters were being formed in the U.S. for operations later in the year. It is now revealed that the twin-jet fighter produced by Bell Aircraft has been designated the P-59 by the U.S.A.A.F.

"Package Guns"

PART of the armament of the B-25H Mitchell, which is equipped with the 75 mm. cannon and 14 machine guns, takes the form of a new mounting known as the "package gun." This is a portable unit containing one or more fixed 0.5in. machine guns which can be installed anywhere desired as a sort of self-contained "blister." In the case of the Mitchell, a two-gun "package" is installed on either side of the nose and fired by the pilot.

DIRECT DELIVERY : Liberators are being delivered to the R.A.F. and U.S.A.A.F. in Italy direct from Canada by Transport Command. This crew, just arrived at an Italian base, represents England, Australia, America and the Scilly Isles.

Memorial Fund

A MEMORIAL FUND, the proceeds of which will be handed over to the R.A.F. Benevolent Fund, has been opened in the name of the late J. Crosby-Warren, recently killed in a test flight accident. Contributions should be sent to Mr. Michael Daunt, Gloster Aircraft Co., and cheques should be made payable to the J. Crosby-Warren Memorial Fund.

Air Transport for P.O.

A SUGGESTION that the Post Office should employ air transport after the war was made at the recent Blackpool conference of the Post Office Controlling Officers' Association.

The resolution was moved by Mr. J. R. Bartlett (Barry) who said that by this speedy means inland mail posted early in the day could be delivered the same day.

Luxury Airliner

THE model of a projected post-war transatlantic luxury airliner to carry 150 passengers non-stop between New York and London was recently shown to air correspondents at the Consolidated plant at Fort Worth, Texas. With a span of over 200ft. it will have two decks and will be called "Consolidated 37."

Evergreen Anson

THERE has probably never been a more useful aircraft than the Avro Anson, and few have equalled its viceless reliability. But many will be mildly surprised to know that even the U.S.A.A.F. now includes it among its range of training aircraft.

This is the Canadian-built Anson V navigational trainer powered by a pair of 450 h.p. Pratt and Whitney engines and having a top speed of 197 m.p.h. Its fuselage is a wooden structure.

Anaglyphs on Show

SOME of the wonderful anaglyphs of bomb damage in Germany which originally were specially prepared by the R.A.F. for exhibition to Mr. Churchill and members of both Houses of Parliament, are now on show for the employees of the Champion Sparking Plug Co., Ltd. The exhibition was opened by Sqn. Ldr. R. A. B. Learoyd, who won the V.C. for bombing the Dortmund-Ems canal in 1940.

Life of a Fortress

IN his report to the U.S. Secretary of War, General H. H. Arnold, Commanding General U.S.A.A.F., revealed that in one of the war theatres the Flying Fortress has an average operational life of 231 days, although in some other theatres its life is several times as long.

In addition to numerous practice, training, tests, supply, administration and ferry flights, the Fortress is reckoned to average 21 combat missions. The actual theatre to which these figures apply is not stated, but the reference seems to indicate the Western zone.

Information Release

THE U.S.A.A.F. also participates in the air-distribution of leaflets in addition to the air-distribution of more lethal objects. For the scattering of the leaflets at a reasonable height which will ensure their covering a wide area, yet not so wide an area that they become "lost," a clever little aneroid release has been developed.

This consists of a light alloy capsule, deformation of which actuates a trip lever, and the capsule is so arranged that it can be pre-set to collapse at any given atmospheric pressure. The leaflets are tied in bundles with a length of string which is looped over the trip lever, the capsule is set, and the bundle is tossed overboard at, for example, 28,000ft.

As it drops, atmospheric pressure on the capsule increases until, at 1,000ft., for example, the pressure causes the capsule to collapse, the trip lever to trip, and the leaflets to scatter on the wind.

For reliability up with the forward troops, the Taylorcraft

AUSTER III

"maid of all work" is powered by the de Havilland Gipsy Major engine

DE HAVILLAND ENGINES

In the attack to-day — on the trade routes of the future

These Avro Lancasters

on their nightly journeys

into the heart of Nazi Germany

consistently overcome

flying conditions such as their

civilian successors in peace-time

will never meet . . . .

. . . . . .

Superplanes by AVRO

They take the strain in War
—let them carry the load in peace

Post-war Civil Aviation

U.S. Aircraft and Agreement : Position of New Types : World Traffic : Shipping and Railways' Interest

IN the House of Lords on Wednesday, May 10th, the Marquess of Londonderry asked the Government to make a statement on their proposed policy for the development of British civil air transport on the following matters: (i) Ministerial responsibility for civil aviation in the United Kingdom; (ii) international regulation of civil air transport; (iii) internal, inter-Commonwealth and Empire air lines; (iv) chosen instruments and subsidies; (v) types of aircraft; (vi) the scope and powers for operating companies.

Lord Rennel expressed the view that a system of civil aviation which was under the direct control of the Air Ministry would never take us anywhere. While the U.S. Air Transport Corps had earned the praise and good will of people it had carried, he could not say the same for the R.A.F. Air Transport Command. American air transport was run by people who realised they were pioneers of future civil aviation, and the difference between the two systems was that the Americans were air-minded and were trying to develop civil aviation. Air Transport Command was not doing anything of the sort. Almost any control would be better than that of the Air Ministry at the present time and there was probably a good argument for making a Department of Civil Aviation in the Ministry of War Transport after the war.

Lord Beaverbrook, in replying, said that Transport Command was intended to serve the military machine, and was not for civil purposes. He was satisfied that B.O.A.C. would continue to function as in the past with satisfaction to the community. The question of the chosen instrument was fixed by Statute. Ministerial responsibility for civil air transport in the United Kingdom rested with the Air Ministry, and the responsiblity for co-ordinating future policy lay with the committee of which he (Lord Beaverbrook) was chairman, but this committee was not an executive body and had no administrative duties. Internal air lines were controlled by the Air Ministry, and the findings of the Commonwealth conversations on inter-Commonwealth and Empire air lines provided for adequate regulation and included plans for an all-red air route.

Although we must admit that the U.S. had a long lead over us in air transport, we had a number of excellent designs for new types, and although progress had been disappointing no blame could be attached to anyone—it was entirely due to the prior needs of war. The York was in small-scale production and giving excellent service with Transport Command and B.O.A.C. A York recently flew 6,857 miles from this country to Delhi in a flying time of 32 hours, which gave an average ground speed of 214 m.p.h. The aircraft carried a payload of four tons on this flight. The Shetland flying boat was due to make its maiden flight in a few weeks' time, but would not yet be put into production. The transport version of the Halifax might fly late this year, but would not be put into production this year; whilst a De Havilland feeder-line small transport machine might fly in about 12 months' time. The Tudor had been held up by military necessities and could not be put into service for some time yet.

American Aircraft Offer

The conference with the United States was most satisfactory and the deliberations had taken them very far along the road towards agreement, but we did not move in the direction of making plans without taking into account our resources of aircraft. Mr. Berle had assured the Government most generously on the question of the supply of transport types in the period immediately following the end of the war and that Americans were prepared to make long-range transport aircraft available to us on a non-discriminatory basis in the interim period before British production of these types got going. It was, however, essential that we should establish systems of British aircraft, engines, supplies and ground equipment at the earliest possible date.

Air transport of the future would be built upon radio apparatus, and this offered an immense field for manufacturing enterprise. It was certainly as important as aircraft and engines—perhaps more important.

Lord Beaverbrook said that Great Britain and the United States were in agreement on the general principles evolved. The true purpose would be to draw up an international convention, air navigation to be implemented by an international transport organisation which would evolve standards, seek to eliminate uneconomic competition, work out for each nation an equitable participation in air transport and maintain equilibrium between air transport capacity and traffic offering.

The Government had no desire to exclude aircraft of other nations from our bases, and on the question of cabotage (the reservation to a nation of all traffic within its territories) Lord Beaverbrook said that it applied, for example, between the U.S.A. and Hawaii and Porto Rico, and also between the United Kingdom and our own Crown Colonies. This was a right we freely conceded to others and there was no resistance to this definition. The Dominions and India would set up a similar system within their own areas.

South American Route Proposal

Lord Essendon said that if we were to attain a position in the air comparable to that we had at sea, it was difficult to believe this could be accomplished through a single corporation. It had been suggested that British shipping companies might use their position to retard the development of air transport in order to protect their shipping trades. Such a policy would be suicidal. The Government should announce their intention to operate a British air service to South America as most important from a national viewpoint. He was authorised by the South American company concerned to make the proposal that they were prepared, whether or not they were ultimately permitted to operate the service, to offer their active co-operation and to place their services at the disposal of the Government.

In urging the railways' claims, Lord Kennet said that far from having any jealousy or suspicion of air transport, the railways ardently favoured it, not as an auxiliary but as a primary method of transport. They would find all the capital necessary and ask for no subsidies nor for preference or advantage over any other concern.

In resuming the debate on Thursday, May 11th, the Duke of Sutherland voiced the opinion that the Government must give consideration to the requirements of the population for private flying. He said that in America small aircraft such as Taylorcraft, Pipers and Stinsons were being produced in large quantities for the Services and their quality and numbers will enable the U.S. to fulfil the world's needs for the first few years of peace. Britain and her Empire cannot be left behind, and he suggested that the Government should interest themselves in this matter.

Lord Denham wished to have one question answered: Are the railways going to be allowed to compete or are they to be shut out from civil aviation after the war?

Viscount Trenchard questioned the meaning of the word monopoly in relation to Lord Beaverbrook's statement, "The chosen instrument is not a monopoly; there is no monopoly at all. It has a monopoly of subsidies for overseas air traffic, but nothing else." Lord Trenchard then queried the exact definition of the word "cabotage" and asked whether it meant flights could be made direct from here to parts of the Empire or whether we must not fly over intervening countries, but round them.

In replying, Lord Beaverbrook challenged the House as to whether they desired that the Act of Parliament creating B.O.A.C. should be repealed, saying that if the shipping and railway companies make proposals supplanting the services of B.O.A.C., without subsidy, the Government would be very glad to listen. Lord Kennet answered that their idea is certainly not to take over only selected portions of the services.

Lord Beaverbrook went on to say that cabotage has nothing to do with innocent passage, nor with freedom of the air, to which Viscount Trenchard replied, "If there is no innocent passage it makes cabotage senseless as you define it."

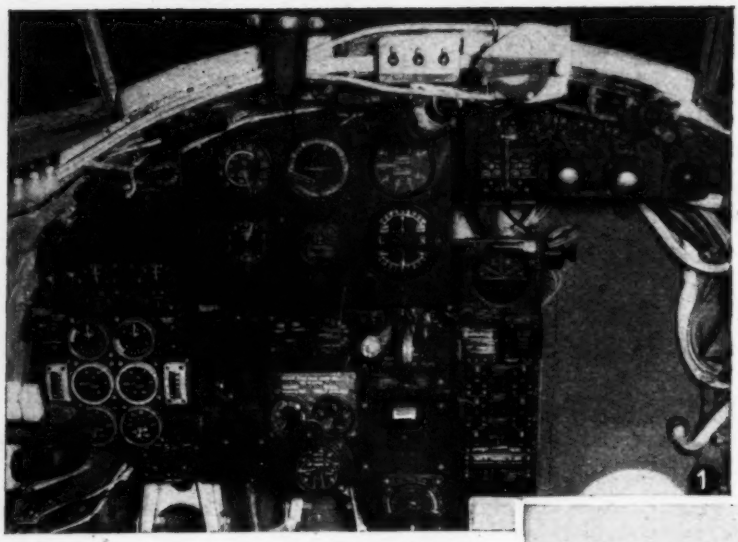
On the subject of time ere we can produce civil aircraft, Lord Beaverbrook said he would not be optimistic about the preparation of civil aircraft during the war, and saw no hope of it until the crises of our war strategy had been brought to a conclusion.

On understanding that the Government opposed it, the Marquess of Londonderry withdrew his Motion.

D

News in

Photographs of Inter

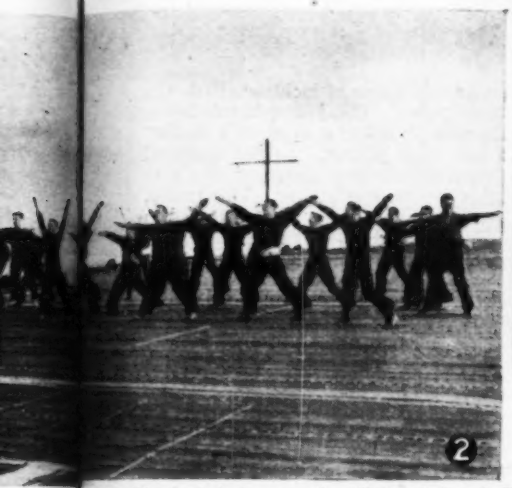


(1) The compact instrument panel of the De Havilland Mosquito fighter-bomber. The bomb-release button is situated by the side of the flap-position indicator dial.

(6) Condemned in its original form by the Truman committee, the Curtiss SB2C Helldiver reappeared in a modified form for the U.S. Army and named the Shrike. This is the first photograph to be issued showing the naval version in use on a carrier. During early trials it was tried as a glider tug.

in Views

Inter om the War Fronts

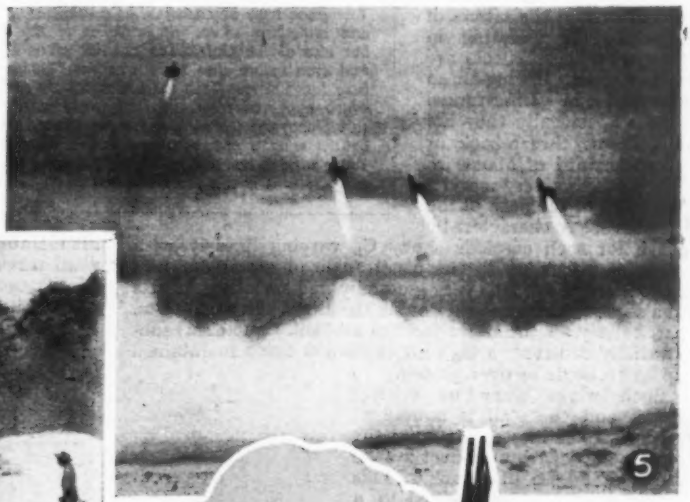


(2) Physical jerks on the flight deck of H.M.S. *Trumpeter* one of the American-built escort carriers.

(3) One more for game. The veteran Lancaster, S for Sugar, which has completed 99 operational flights. Her captains have gained a D.S.O. and two D.F.C.s. She has dropped a million pounds of bombs on enemy targets.

(4) Loading a field gun into a C.G.13A glider. The tare weight of the CG13A is 8,765 lb. and the payload 8,000 lb. Length 54ft. 2in., span 85ft. 6in. There is accommodation for 30 men.

(8) Vultee Vengeance dive bombers, which were built to a British specification, are doing good work on the Burma front. Even for all-metal aircraft the operating conditions on this front are very severe.



(7) Some versions of the North American B25 Mitchell carry a fixed, forward-firing armament of one 75 mm. cannon and four .5in. machine guns in the nose and another four .5in. machine guns in blisters on the fuselage. The Americans refer to the blister guns as "package guns," because they are self-contained units which can be fitted to any aircraft.

(5 and 9) U.S. anti-aircraft gunners are trained by shooting at target rockets. These rockets have a velocity of 450 m.p.h. (675ft. per sec.) and are 59 inches in length. Against these fast-moving targets the gunners practise with all A.A. weapons from .5in. to 40 mm. Rockets used for night-firing practice are painted white.

Rhombic Ruminations

The Designer of the Warren-Young Tandem Explains Why the Machine Should be Viceless

By NORMAN HALL WARREN

THE Warren-Young tandem monoplane to which reference was made in *Flight* of November 18th, 1943, is designed for the owner-pilot, and with this object in view a design has been evolved in which safe flying characteristics are primary considerations. Freedom from vice at high angles of attack was the aim of the design. With this aircraft the sudden stall is eliminated, and stability in pitch and roll is achieved by use of the particular wing formation, and without the aid of mechanical devices.

IN our issue of November 18th, 1943, we published a note by Mr. T. R. Young on the tandem monoplane planned by him and Mr. Warren. That note was, in effect, a reply to the Editor's article of August 12th, 1943, in which was asked the question, "Does the tandem still have a future?"

Since then Mr. George Miles has contributed his views (April 27th, 1944) and some photographs of the Miles "Libellula" (May 4th, 1944). In this article the designer of the Warren-Young states the basic principles upon which he worked in arriving at the unorthodox layout.

To us it still remains open to question whether the Warren-Young can truly be classified as a tandem. It seems to be that and something more. It partakes of the tandem principle, but also of the Cedric Lee circular plane built around 1912. And even before that there was the "Rhomboidal" of early Brooklands days. Then there was a little American light plane which appeared after the first world war. In that machine (a biplane) the top wing had a pronounced sweep-back and the bottom wing a sweep-forward and a dihedral. The Warren-Young differs, however, in having the wing tips common to both wings, and it is this feature which distinguishes it from others.

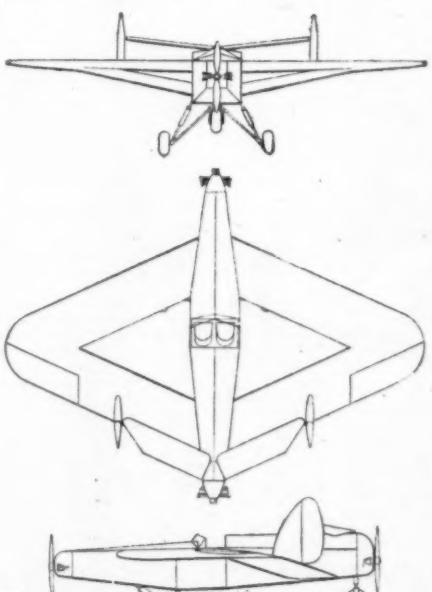
The principles upon which these properties depend derive from the characteristics of swept-back and swept-forward aerofoils, and also from the effects of two aerofoils operating in tandem. These effects are well known, having been observed in wind-tunnel tests. Specifically they are as follows: Sweep-back or sweep-forward of about 20 deg. produce a very marked flattening of the peak of the lift curve. A characteristic curve for such aerofoils shows C_L varying linearly with angle of attack up to the usual angle of maximum lift; thereafter the lift falls very gradually and smoothly, to rise to a second peak at about double the angle. In some tests, particularly for the swept-forward aerofoil, C_L remains substantially constant, a high lift coefficient being maintained up to an angle of over 30 deg.

Such wings show no critical angle, and the stall is a gradual process, spreading slowly over the surface and distributed over a wide range of angles of attack. This sweep effect can be ascribed to a lateral flow, due to the pressure gradient along a line normal to the axis of symmetry of the aircraft. The lateral component ejects the stagnated stream outwards in the case of the swept-back wing and inwards for the swept-forward wing. The manner in which the stall occurs for the swept-back and swept-forward wing is therefore dissimilar. With the swept-back wing, the turbulence spreads from the trailing edge and eventually affects the tip region, leaving the centre part of the wing relatively unaffected. An exactly opposite condition obtains for the wing with forward sweep, and here the tip remains unstalled at high angles.

Stable C.P.

The principal characteristic of a tandem aerofoil combination concerns the behaviour of the centre of pressure. This, when the rear planes are not set at a greater angle of incidence than the front planes, has a stable travel. This is due to the downwash, which causes the rear planes to operate at a smaller angle of attack than the front planes. As the angle of attack of the combination is increased, however, the rate of change of lift is higher for the rear planes. This results in a rearward, and therefore stable, overall movement of the centre of pressure. Such tandem formations are consequently stable longitudinally and do not require a tailplane.

The influence of the lift characteristics of the tip surfaces in relation to those of the front and rear planes is important in modifying the overall centre-of-pressure behaviour. The precise adjustment of this relation, by suitable choice of aerofoil section and taper ratio for the tip surfaces, will affect the stability characteristics of the aircraft. Obviously the qualities desired are: a smooth resultant lift variation, with lift maintained up to a high angle of attack; a steady rearward travel of the centre of pressure with increasing incidence; and no excessive diving moments at the high-speed end of the range.



Docile Behaviour

From a consideration of the foregoing principles the behaviour of the Warren-Young tandem may be estimated. The front planes will reach maximum lift at the usual angle of attack. With increase of angle, the lift of the rear planes will continue to rise due to the downwash effect, whilst the C_L of the front planes will fall gradually. The resultant lift coefficient for the combination will therefore continue to rise, though with a reduced slope. Eventually, with increasing incidence, the rear planes will reach maximum lift and, due to the forward sweep, the lift will be maintained, showing no discontinuity at very high angles. This history, which is dependent upon the choice of aerofoil sections and the degree of decalage, reveals a smooth and gradual variation of lift, with no critical angle, and a steady backward movement of the centre of pressure.

Stability in roll arises directly from the differential stalling, since rolling instability is associated with the stall, and here the instability of a stalled part of the formation is damped by the stability of an

RHOMBIC RUMINATIONS

unstalled part. The Warren-Young aircraft therefore should have a harmless stall, and be laterally and longitudinally stable at exceptionally high angles of attack. Lateral stability below the stall is contributed by the sweep-back of the front planes, the dihedral of the rear planes, and the positioning of wing surface above the centre of gravity of the aircraft.

From the structural viewpoint the formation is clearly advantageous. The joining of the front and rear planes, and the large dihedral of the rear planes, give a high torsional and flexural rigidity, which results in a relatively low structure weight.

The peculiarities of the wing formation result in incidental aerodynamic effects, which bear upon the more detailed design, and some details can only be decided by the evidence of a pressure plot. For example, the pressure distribution on the tip surface cannot be confidently predicted in the absence of experimental evidence, although free-flight model tests have revealed no adverse tendencies. A feature which will be noticed is the exceptionally large dihedral of the rear planes. This is largely ineffective, however, and is probably equivalent to a dihedral of conventional angle, since forward sweep gives an anti-dihedral effect. Finally, and with regard to the incidence of the rear planes, the value of the downwash is inversely proportional to the distance from the trailing edge, decreasing with distance along, above or below the wake. The effective angle of attack of the rear planes is therefore variable along the span, with effective washout towards the tips, and it may be necessary to twist the rear planes partially to counteract this effect, which will otherwise be considerable.

Early Attempt

It has been asked in what way the Warren-Young aircraft differs from certain other "Safety-First" aircraft; in particular, the annular aircraft due to Cedric Lee (or was it Kitchen?), and the more recent Willoughby Delta. Particulars of the annular aircraft, which was built round about 1912, are not to hand, but it would appear likely that the properties of low aspect ratio in combination with a tandem effect are the primary characteristics. It is possible, moreover, that the designer was unaware of the mode of operation, since in those days little was known about aerodynamics, and there was no standard form of aircraft. It is also obvious that structurally the annular type is not so desirable; it is not only necessarily complicated but cannot be compared with the Warren-Young type for structural efficiency. The Willoughby Delta exploited the properties of aerofoils of very low aspect ratio, and neither in its shape nor the principles involved, as specified in Willoughby's patent, did it bear any resemblance to the Warren-Young.

Tested in Model Form

The war has deferred the construction of the Warren-Young full-size aircraft, and Air Ministry priority has prohibited wind-tunnel tests so that, with the exception of some free-flight tests with a large model in 1937, there has been no opportunity to acquire any quantitative data. The aircraft is, therefore, presented as a project, designed to give a performance well founded on theory, supported by various tests, and further substantiated by free-flight model tests.

In the general arrangement drawing is shown a two-seater twin-engined light aircraft of about 90 h.p. It is designed in wood, and low cost (demanding simplicity of structure and fabrication) is the keynote of the design. Twin engines enhance reliability, and the fore-and-aft arrangement obviates a turning moment consequent upon the failure of one of them; therefore single-engined power is delivered to the full advantage. Furthermore it should be noted that with both engines running, torque reaction is eliminated [except in the fuselage.—ED.]. Conventional ailerons and rudders are fitted, but there is no tailplane, and control in pitch is provided by the elevators fitted between the fins and fuselage.

BOOK REVIEWS

An Introduction to Principles of Flight, by W. F. Ware, B.Sc. Macmillan, 3s.

THIS little book will undoubtedly fulfil a very useful purpose, presenting, as it does in a simple and straightforward manner, the cardinal facts of a subject normally covered only by weighty and purely technical works.

The author points out in the preface that an attempt has been made to keep the treatment as straightforward and non-technical as possible, and this has been done in a singularly successful fashion which in no way detracts from the value of the lessons presented. The text is clearly set out and the numerous illustrations give the reader an immediately clear grasp of the principle and action explained. A further point which will appeal to many who read this book is the way in which the author has reduced the mathematical aspect to a bare minimum essential, and has further taken obvious pains to resolve down to basic ciphers those formulæ he has perforce included.

At the end of each chapter, a few questions are set on the preceding subject matter—the answers are also given—and these questions will, no doubt, enhance the understanding of the reader who is sufficiently discerning to work out the answers for himself.

Overture to Life. By John Michael Townend. Rich and Cowan, 7s. 6d. net.

THIS remarkable book germinated, says the author, in a series of letters which he wrote to his parents, but it is published as a series of dated articles which read more like pages from a voluminous diary. The date of the first is January 21st, 1942, and that of the last March 12th, 1943.

The author was aged 18 when he was accepted by the Royal Navy for training as a pilot in the Fleet Air Arm, and was shipped off, wearing the uniform of a naval rating, to Canada and the United States. For such a young man he had an extraordinarily highly developed taste in music, art, literature, and dramatic (including film) criticism; he had an almost precocious gift for philosophising (though in one of the later chapters he writes: "I am becoming more frequently aware, as I grow older, that there are usually two sides to most questions—a fact which youth, in its intolerance, generally ignores."), and in addition he has been blessed with an unusual capacity for descriptive writing. For all these reasons his book is readable and enjoyable.

Those readers who have never visited the Continent of North America will learn a great deal from this book about Canada and the Canadians, and likewise about the United States and the Americans. They will also learn a lot about the methods of flying training pursued in the Dominion and the Republic. The young author found kindness and hospitality everywhere, and his book should help to promote the cordial feelings between British Islanders and the peoples of the American Continent which are so important for the future happiness of the world.

Teach Yourself Astro Navigation, by "Kaspar," English Universities Press, 3s.

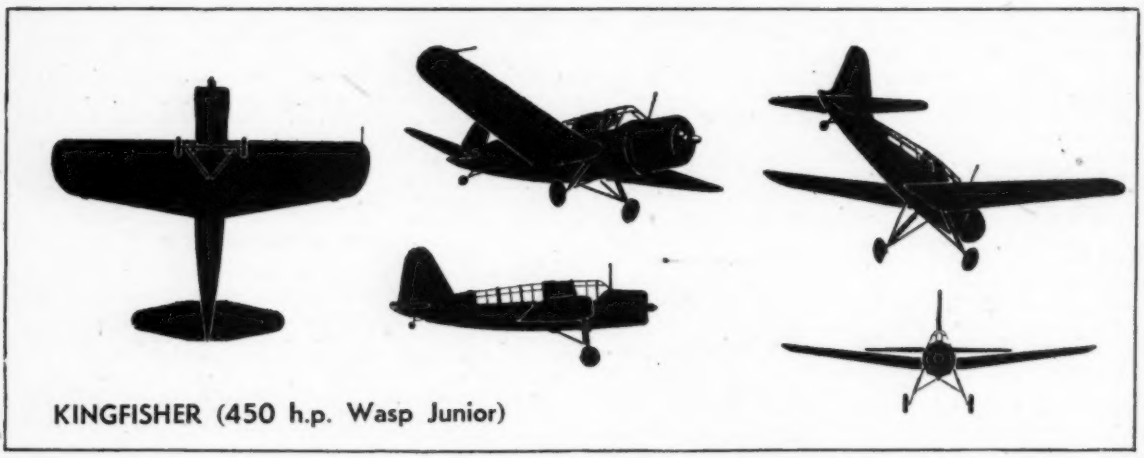
THE author of this, the latest of the "Teach Yourself" series dealing with aviation subjects, is Flt. Lt. S. R. Millard, late chief ground instructor, No. 5 A.O.N.S., who is obviously well fitted to write authoritatively and instructively upon this subject. Somewhat naturally, however, a really simple exposition of astro navigation is, by the very nature of the subject, almost an impossibility.

"Kaspar" has set out the "gen" in this little book in a first-rate manner and the text is amply illustrated with line drawings and diagrams, whose clarity should help in large measure the reader's grasp of the instruction. At the end of each section representative examples are given of the matter discussed in the preceding pages.

Although we cannot help feeling the implication of the title is somewhat ambitious, the motive inspiring it is very praiseworthy, and many who buy this book will, after reading it, have obtained a further insight into the mysteries of astro navigation, and, what is far more important, a constructive knowledge of how the lessons learned may be applied.

Studies in Recognition

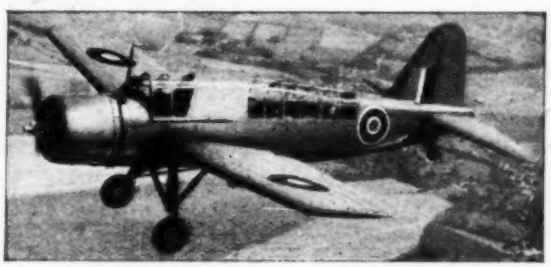
Aircraft in Ri



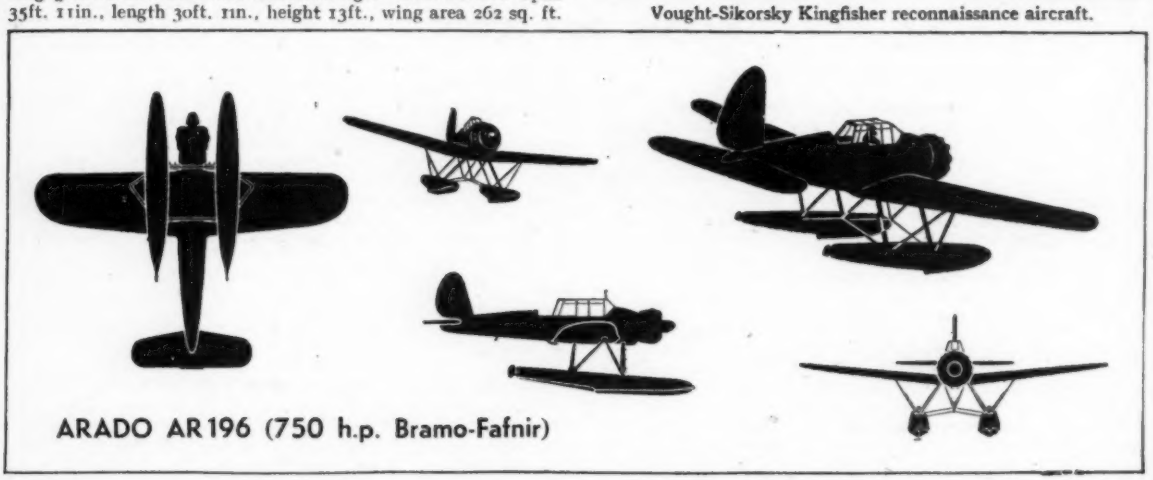
KINGFISHER (450 h.p. Wasp Junior)

IN service with the U.S Navy, the Fleet Air Arm and other Allied services, the Vought-Sikorsky Kingfisher (OS2U-1 and OS2U-3) is powered by a 450 h.p. Pratt and Whitney Wasp Junior radial engine. The landplane version (illustrated here) has a top speed of 200 m.p.h. but the single-float seaplane's top speed is 190 m.p.h. and it is equipped for catapulting. All are designed as general-purpose two-seater Navy observation and reconnaissance aircraft.

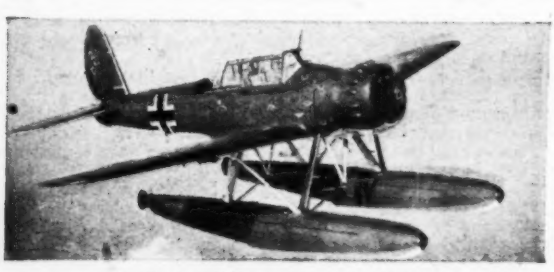
Recognition features include low wings of low aspect-ratio tapering on trailing edge only to broad round tips; an unusual wide-span tailplane with rectangular centre section, tapering outer panels and small round tips; large single fin and rudder, long glass-house and fixed undercarriage. Dimensions: Span 35ft. 11in., length 30ft. 11in., height 13ft., wing area 262 sq. ft.



Vought-Sikorsky Kingfisher reconnaissance aircraft.



ARADO AR196 (750 h.p. Bramo-Fafnir)

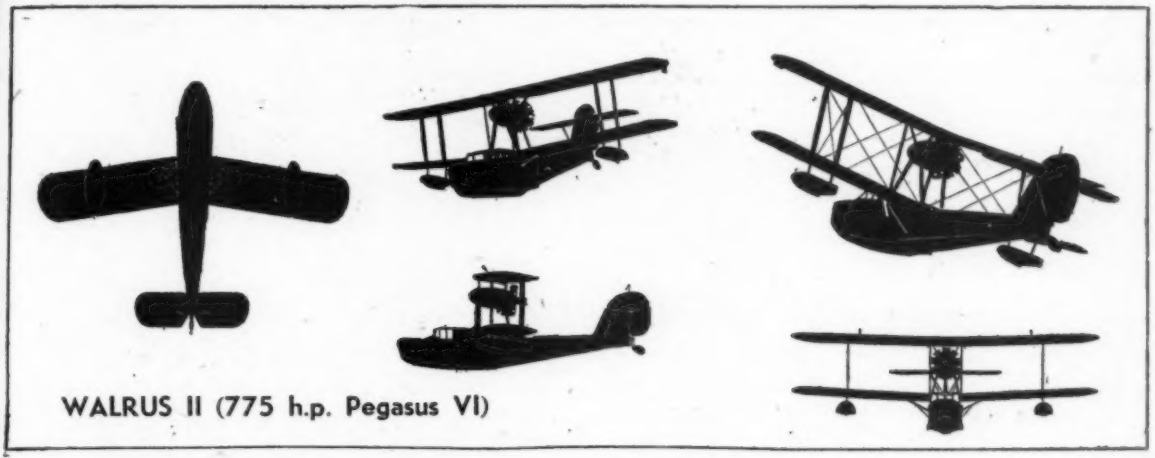


Arado Ar 196 Reconnaissance seaplane.

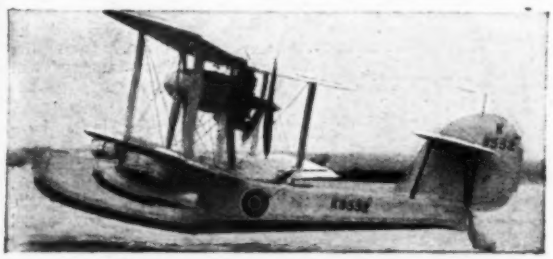
ALTHOUGH primarily designed as a two-seater reconnaissance floatplane for shipboard use, the Arado Ar 196 has been used extensively for more aggressive duties, including interception of Coastal Command aircraft. The *Graf Spee* and the *Bismarck* carried armed reconnaissance versions. Those used for interception have two cannon and two machine guns firing forwards and a single "free" gun in the aft cockpit. The engine is a 750 h.p. Bramo-Fafnir air-cooled radial and top speed is 193 m.p.h.

Recognition features include low aspect-ratio low-wing slightly tapered to broad, round tips; wide-span tailplane tapering on leading edge only to round tips, the single-piece elevator projecting well aft; single fin and rudder. Dimensions: Span 49ft. 6in., length 38ft. 7in., height 16ft. 5in., wing area 408 sq. ft.

...ing Attitudes



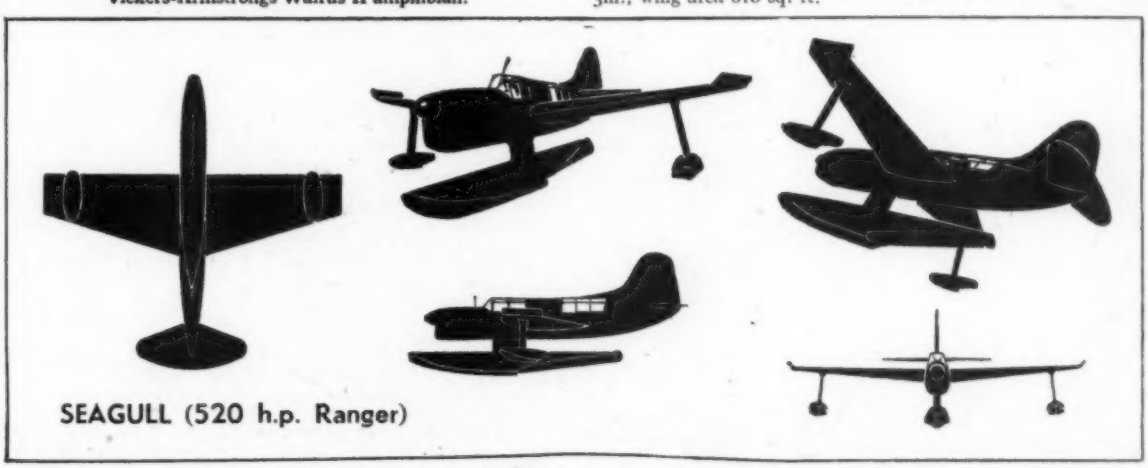
WALRUS II (775 h.p. Pegasus VI)



Vickers-Armstrongs Walrus II amphibian.

TRACING its ancestry back to the Supermarine Baby single-seater flying boat of 1918, the Vickers-Armstrongs Walrus as we know it to-day was first built to an Australian order in 1935. Familiarly known to the Fleet Air Arm as the "Shagbat," it is still doing valuable service in many waters, including that of ambulance with the Air/Sea Rescue Service. Being an amphibian it can either be catapulted or operate from carriers and land bases, and it is extremely seaworthy. Power is supplied to a pusher airscrew by a 775 h.p Bristol Pegasus VI mounted in a power-egg. Top speed is 135 m.p.h.

Single-bay, parallel-edged wings are backswept and of equal span, the strut-braced rectangular tailplane is set high on the large fin, and the wheels retract into the lower wing. Dimensions: Span 45ft. 10in., length 37ft. 7in., height 15ft. 3in., wing area 610 sq. ft.



SEAGULL (520 h.p. Ranger)

ANOTHER Navy reconnaissance aircraft designed for use either as a single-float seaplane or as a landplane, is the Curtiss Seagull (SO3C-2). It is known as the Seamew in the Fleet Air Arm. The same aircraft produced by the Ryan concern has the designation SOR-1 and is supplied only to the U.S. Navy. All are powered by the 520 h.p. 12-cylinder inverted "V" air-cooled Ranger engine. Top speed is 190 m.p.h.

Of mid-wing design, the seaplane version has a pedestal-mounted single float and cantilever stabilising floats. The low aspect-ratio wings taper on trailing edge only to square up-turned tips, and the tailplane tapers sharply on the leading edge and has a one-piece curved elevator. The large rounded fin and rudder has a spinal fillet extending over the rear cockpit. Dimensions: Span 38ft., length 36ft. 9in., height 11ft. 3in., wing area 290 sq. ft.

Curtiss Seagull, or Seamew, reconnaissance aircraft.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Jap Bomber

THE Mitsubishi OB-01 bomber and torpedo aircraft in service with the Japanese Naval Air Force and powered with two Mitsubishi Kinsei engines of 1,600 h.p. each, is credited with a maximum speed of 275 m.p.h. at 11,500 ft.

With a range of 1,500 miles it carries 1,760 lb. of bombs or one 18in. torpedo.

French Final Drive

NOT only perfume, silk and food have the Germans secured in France. Apart from the regimentation of the French aircraft industry for the production of German types and accessories, there is striking evidence that whenever a technical improvement could be found, the Germans were not shy of adopting it to their needs.

Such is the fate of the transmission arrangement of two aircraft engines driving remotely located contra-rotating airscrews, reported to have been adopted on the Heinkel He 177 and also planned for the predicted He 274.

This arrangement of the He 177, much publicised in evidence of Germany's undiminishing technical ingenuity, is in fact a pre-war French idea developed for the N.C.110-B.5 heavy bomber, a model of which was exhibited at the 1938 Paris show.

Originally designed for use with Hispano - Suiza 12Y liquid-cooled engines and designated N.C.-T.1, it consists of two motors driving through a pair of flexibly coupled extension shafts and a common double helical reduction gear unit, two co-axial contra-rotating airscrews.

The gears are of the double helical type mounted on roller bearings. Both engines rotate in the same direction. A direct 2 : 1 reduction is used for the rear airscrew while a third pinion is employed in the gear train to give a reversed rotation to the forward airscrew. Incorporated in the gear assembly are two electro-motors for operating the pitch-change mechanism, two hydraulic couplings to permit individual or common drive of the airscrews and auxiliary drives for air pump, vacuum pump, generator, etc.

In Search for Labour

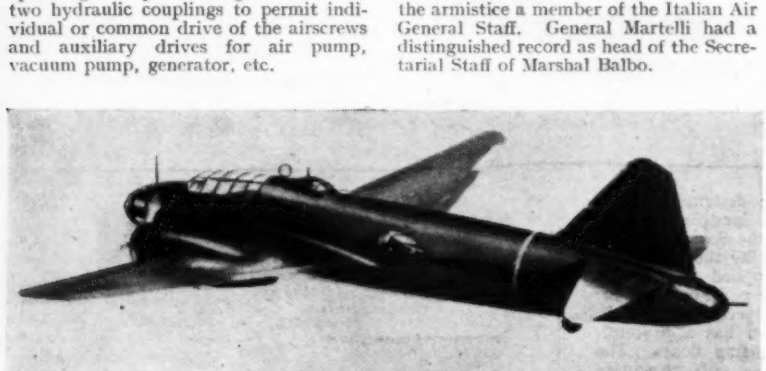
ADVERTISEMENTS published in the Milan press reveal that the Junkers concern is feverishly trying to recruit Italian skilled labour for their factories.

In this connection it may be recalled that prior to Italy's collapse Junkers were very keenly interested in the Italian aircraft industry and were represented in that country by Capt. Fischer von Poturzyn, a member of the Junkers Board.

FROM FRANCE FOR THE *LUFTWAFFE*: This transmission arrangement, originally developed for a French bomber, has been adopted for the Heinkel He 177.

Executed

THE Swiss Telegraphic Agency reports from Chiasso that Generals Lordi and Martelli, of the *Regia Aeronautica*, were among the 320 hostages recently shot in Rome. General Lordi was before the armistice a member of the Italian Air General Staff. General Martelli had a distinguished record as head of the Secretarial Staff of Marshal Balbo.



JAP BOMBER: The Mitsubishi OB-01 powered with two Kinsei engines of 1,600 h.p. each, has a span 82ft. 4in., a length of 66ft., and carries a bomb load of 1,760 lb. or one torpedo.

A New Fighter ?

ACCORDING to the German News Agency, a new type of fighter aircraft was employed by a leader of a *Luftwaffe* unit in a recent combat with American day bombers.

Bombers' Harvest

SEVENTY to eighty per cent. of Berlin's war factories are said to have been destroyed or put out of action, according to an estimate of a Berlin resident recently arrived in Switzerland.

Traffic

MALERT, the Hungarian Air Transport Company, announced that since May 2nd *Lufthansa* aircraft have been again landing at the Budapest airport.

Repeat Warning

GRAMOPHONE records reproducing the various types of air-raid warnings are now being made by the German gramophone record industry. These records, says the German Transocean Radio, will be used in factories and big plants so that warnings will not be missed.

The Floating Hedgehog

THE following details of German seaborne A.A. batteries operating in the North Sea and the Channel are given by the *Militaerische Correspodenz aus Deutschland:*

The latest means of air defence to be used on active service are seaborne A.A. batteries which, however, must not be confused with the A.A. cruisers, destroyers and barges which were introduced earlier. These seaborne A.A. batteries are mainly used as the first defensive belt in the coastal waters, which is followed by the ground A.A. artillery on the islands of the coast.

Old units of the German Navy form the floating base for these batteries which are moved by their own power and the speed of which is sufficient to cover a distance between one action and the next—a fact which presents the attackers with new surprises in defence. The deck of these units has been cleared of all superfluous superstructures and installations and the turrets and naval guns have been replaced by medium and heavy guns with single, twin and triple mountings, supported by twin- and four-barrelled light and medium A.A. guns against low-level attacks. Special contraptions prevent, or render more difficult, the sinking of the ship as a result of bomb damage. By taking on water ballast, which can be disposed of after a short time, the ship may be grounded and from this position be used as a static battery.

Seen from a distance, this kind of floating A.A. battery gives the impression of a giant hedgehog floating on the surface of the water with its quills raised in defence.

Bombing Policy

Why I Believe in the Night Offensive

By JAMES BARLOW

THE question of the effectiveness and method of our air offensive against industrial Germany has frequently raised queries in the minds of many of the public. Would it be better to continue the night offensive with the bombers rearmed with .5in. or 20 mm. weapons, switch to daylight bombing while retaining the .303in. armament plus great bomb load, or rearm with larger calibre weapons and bomb by day with our Allies?

In regard to the latter two questions the same difficulty, that of congestion in the air and on the airfields, arises. Also a good deal of the weight of assault would be lost if our aircraft were to be fitted with heavier defensive armament. Although a daylight assault on the same scale as the present night effort could now be protected by fighters, the mentioned difficulty of congestion would still be present, and the Germans would get a lot of sleep which, it must be admitted, would be a bad thing as the effect on morale and physical strain of a night raid is more considerable than that of one by day.

With regard to the defence of night bombers the point is one of range. The night fighter is usually within range of .303 ammunition before either the bomber crew or fighter pilot see one another. There are obvious exceptions to this, of course, such as moonlit nights on which the R.A.F. seems to turn to targets in occupied territories without the enormous defences of German targets. If .5in. or 20 mm. weapons were fitted the advantage would not be so apparent as in the daylight assault, when fighters and bombers can exchange fire at 800 yards.

The whole question is, in the writer's opinion, that of the immediate and ultimate objective. The idea of strategic bombing is to grind down the enemy's industry of war so that the liberation of Europe and occupation of Germany can be effected with the minimum of effort and loss. Ever since 1942 the R.A.F. has packed a powerful punch, and the whole enormous German war structure has suffered terribly. How much more slowly would we have won this amazing war of attrition if we had reduced the bomb load of each aircraft by over 4,000 lb. The bomb load of the almost forgotten Wellingtons, Whitleys, Manchesters and Hampdens, which carried the main weight of the first 1942 assault, would have been negligible had they carried heavy-calibre weapons. Furthermore, before the assault had gained enough impetus to knock out any branch of the enemy's industry the Germans would probably have found the answer to the heavily defended bomber, and the stirring achievements of the early American attack might not have been able to develop into the major threat they are to-day.

Target Allocation

Some critics say that the R.A.F. continually attacks the same targets. Sometimes this may appear to be so. Consider, however, how far the battle has been carried. Places such as Rostock, Lubeck, Remscheid and Peenemunde have their dreadful quota and are not visited again unless repair work is put in hand. For Hamburg, Essen, Cologne, Hanover, Düsseldorf, Dortmund, Duisburg, Kassel and a host of others perhaps up to a dozen major assaults (1,500-3,000 tons) have done the job, while occasional visits to stir the rubble are carried out. The Battle of Berlin may be carried on a little longer, while the battles of several other German cities are still on.

These same critics also question the ability of the R.A.F. to aim as accurately by night as our Allies do by day. In their publication, *Target Germany*, the Americans have made it clear that, although good, their Sperry bombsight has not the "pickle barrel" accuracy which the Press—particularly their own Press—at one time claimed for it. It would seem that both our own and the American bomb sights are of about the same value under the same conditions—good but not by any means infallible. Therefore the question of sighting depends on whether it is better to do the job by day or by night, which brings us round to the method of assault.

Day and Night Sighting

Naturally, sighting is easier by day, although with thick cloud covering the target or with fighters making furious sallies against them the day bombers have no picnic, while the height at which day bombers have to fly must impair the accuracy, particularly with the permanently misty horizons of Europe. By night the target area is marked out by particularly skilled navigators—the Pathfinders—so that whether there is cloud or not the area within which the bomb load has to be dropped is marked out. The Pathfinders have been introduced as a method of increasing the speed of delivery of an attack so that the R.A.F. bombers need not "stoodge" around making several individual runs, thus leaving themselves more liable to fighter interception and increasing the risks of collision.

The question of bomb load and of bomb type is another answer to the critics of night bombing. Bearing in mind that the R.A.F.'s objective has been ever to increase the weight of assault, so that the enemy's capability of waging war could be diminished the more quickly, the need for more powerful bombs arose. The effect of a 4,000 lb. bomb is probably a good deal more devastating than two 2,000 lb., or even eight 500 lb. missiles, although it is agreed that the possibilities of a hit with eight bombs are greater than those with one. However, this is a question for the daylight precision bombers rather than night area bombing in which the various bomb loads may overlap. If it is agreed that the 4,000 lb., 8,000 lb. and 12,000 lb. bombs are needed to do the area devastating more powerfully and quickly, then it must follow that the idea of heavy defence of the night bomber must be sacrificed, at any rate in the existing types of R.A.F. bombers. Admittedly, this does seem hard on the R.A.F. bombers, which cannot have fighter escort, heavy defensive armament, or even fly in battle formation. But it is, we hope, only an interim period at present while the German air strength, in the factories and in the air, is worn down to a strength that does not matter. This procedure is in operation, although it must be expected that the enemy will devote all his energy and cunning to solve the problem.

It is still not realised how absolutely complementary the assaults of the R.A.F. and Eighth U.S.A.A.F. Bomber Commands are. Although the Americans do occasionally, and particularly in bad weather, indulge in area bombing, their principle has from the start been the precision bombing of particular objectives. If it is found that in devastating an area the R.A.F. have missed a particular plant then the Americans are able to pin-point it. Their idea was always to attack individual targets; several simultaneously now that their strength is great, which has the added attraction of confusing or at least splitting the enemy's fighter resources.

Finally, the R.A.F. for two years has been waging a separate war against Germany; against the plants and the people making submarines, ships, tanks, vehicles, engines of all types, armaments, instruments, and against the whole huge concern which goes to make the war effort of a nation. Our loss of bombers is grievous, but it must be borne in mind that each R.A.F. assault is a battle in the separate war the R.A.F. is waging against Germany.

Camera Recorder

New Hawker Instrument Writes Time Histories of Acceleration, Control Movements and Stick Forces

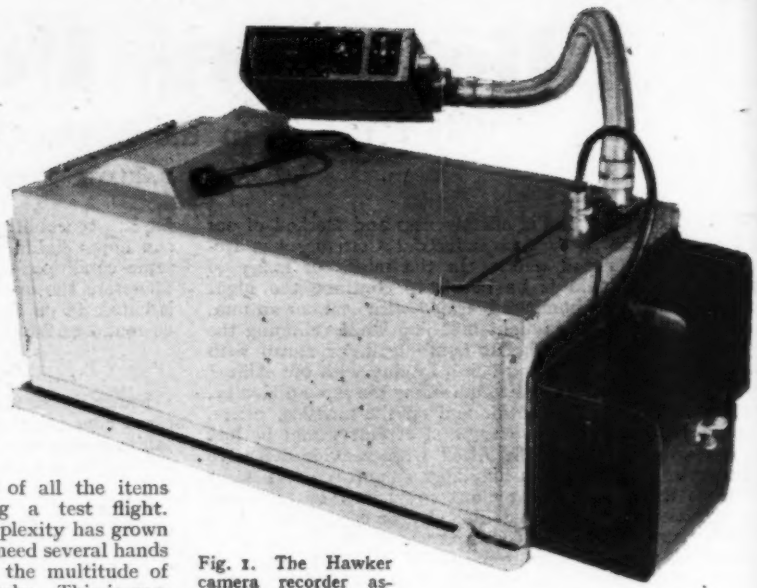


Fig. 1. The Hawker camera recorder assembled, complete with control unit.

UNTIL comparatively recently the performance of aircraft was such that the test pilot could make notes on his knee pad of all the items which needed to be recorded during a test flight. Gradually not only performance but complexity has grown to such an extent that a test pilot would need several hands and several pairs of eyes to cope with the multitude of things that have to be done simultaneously. This is particularly so in the case of, for example, a single-seater fighter, partly because of its high performance and partly because the pilot is the only member of the crew. A modern fighter climbs at over 3,000ft. per min. and the Typhoon, for instance, has 17 dials to watch. In multi-seater aircraft it is usually possible to carry one or more observers, each of whom has some specific portion of the equipment to watch.

Automatic Photography

In his recent talk to the London Association of Engineers Mr. Lankester Parker quoted from the lecture given by Mr. E. T. Jones to the R.Ae.S. last February a passage which stressed the desire of all engaged on test work to replace visual-reading instruments by recording instruments. Such an outfit has been in use for some time by Hawker Aircraft, Ltd. It has been designed by Mr. P. D. Betteridge of the Hawker technical staff and is, briefly, a box containing the usual aircraft instruments and a number of Desyn remote indicators, lights for illuminating the instruments, and a camera for photographing them.

Fig. 2. The recorder with covers for camera, switchgear and light box removed. The panel of instrument dials fits in the open end of the light box.

The camera used in the Hawker camera recorder is a Pathescope II, which takes 600-700 frames on 9.5 mm. film. Provision is made for taking single shots, the usual 16 frames per second when used as a cine camera, and automatic exposures at 1/6, 1/3, 1, 2, 4, 8, 12 and 24 seconds' intervals. The power supply is that of the aircraft (24 volts, 15 amps.). The entire outfit comprises the actual recorder, a control unit, and the pilot's operating button on the control column (actually the gun-firing button).

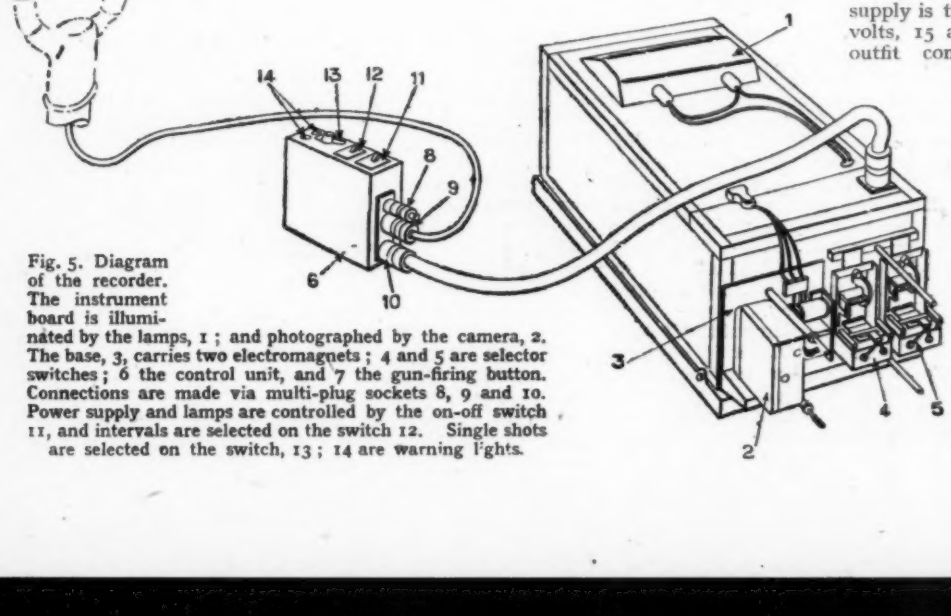


Fig. 5. Diagram of the recorder. The instrument board is illuminated by the lamps, 1; and photographed by the camera, 2. The base, 3, carries two electromagnets; 4 and 5 are selector switches; 6 the control unit, and 7 the gun-firing button. Connections are made via multi-plug sockets 8, 9 and 10. Power supply and lamps are controlled by the on-off switch 11, and intervals are selected on the switch 12. Single shots are selected on the switch, 13; 14 are warning lights.

Main components are shown in Fig. 5. The instrument panel forms one end of the recorder box and is made quickly detachable so as to facilitate a change of instruments. The panel is illuminated by the lamps, 1, in the top and bottom

of the box and is photographed by the camera, 2, placed at the opposite end of the box. Wide-angle lenses were not available when the instrument was built, and so an ordinary lens was used in conjunction with two mirrors. These can be seen in Fig. 2. The camera is mounted on a rigid base, 3, which also carries two electromagnets. These operate a balanced armature, which operates the camera control lever, raising it for single or automatic shots and depressing it for cine exposures. Automatic operation is controlled by selector switches, 4 and 5, which are of the automatic telephone type.

The pilot controls the operation of the recorder by means of the control unit, 6, and the gun-firing button, 7. The power supply is via the plug-and-socket, 8, on the control unit. This, and the plug sockets 9 and 10 render all items readily and separately detachable.

Interval Exposures

Normally the pilot will wish to take photographs at fairly long intervals. For instance, during a climb he may wish to take a picture every 12 seconds. To do this he switches on the power supply and lamps by means of the on-off switch, 11, and, with the switch, 12, in the "auto" position selects the 12-second interval on the 9-position switch, 13. The camera is then started by pressing and releasing the gun-firing button 7. It continues to run and to take a picture every 12 seconds until the pilot again presses and releases the button.

For taking single exposures the pilot switches on and, with switch 12 in either cine or auto position, selects single shots by means of the 9-position switch, 13. Single shots will then be taken each time the gun button is pressed and released.

In certain flight tests, such as rapid manœuvre or a dive, the changes in the quantities which are being measured may be so rapid that even the one-sixth of a second interval may be too long. In such cases the pilot sets switch 12 at "cine" and switch 13 at anything except single shots. The camera is then started by pressing and releasing the button and continues to operate at cine frequency (16 frames per second) until the gun button is again pressed.

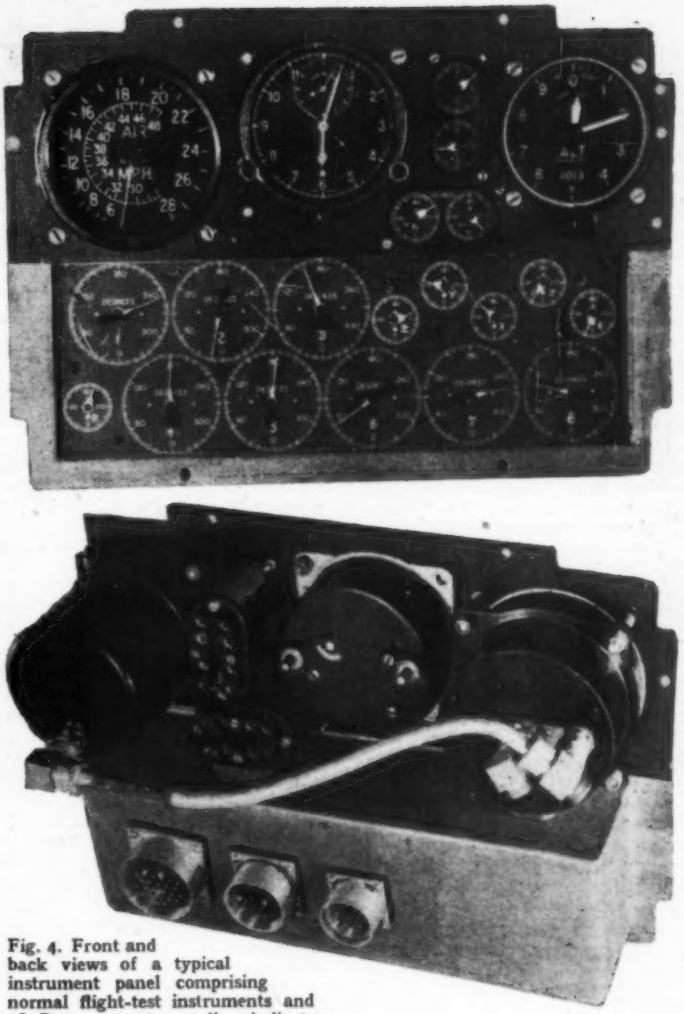


Fig. 4. Front and back views of a typical instrument panel comprising normal flight-test instruments and 18 Desyn remote-reading indicators.

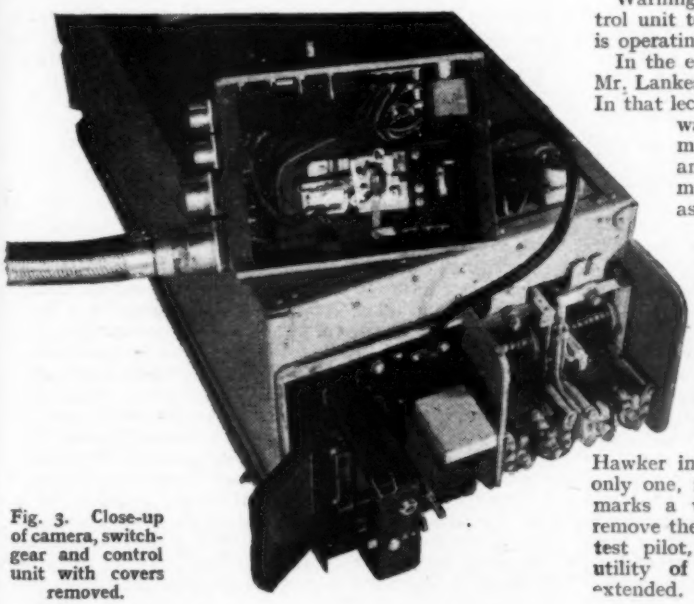


Fig. 3. Close-up of camera, switch-gear and control unit with covers removed.

Warning lights (14 on Fig. 5) are provided on the control unit to indicate when and at what rate the recorder is operating.

In the earlier part of this article reference was made to Mr. Lankester Parker's quotation from Mr. Jones's lecture. In that lecture Mr. Jones pointed out that, although there was a need to replace visual reading by instruments, the recorded histories of control movements and aircraft responses must only be used to augment, and to give reasons for, the test pilot's assessment of controls, aircraft behaviour, etc. They must not, he said, be used by the engineer to prove on paper that the test pilot's general assessment is wrong.

There is little doubt that there Mr. Jones expressed a fundamental truth, and that, as he said, the test pilot's opinion must be accepted as final. Nevertheless, with the approach of jet-propelled aircraft reaching speeds never before attained, in climb as well as in horizontal flight, the recording outfit seems likely to assume ever-greater importance. The Hawker instrument just described is not, of course, the only one, nor is it claimed to be the final word, but it marks a very good beginning. When pressure cabins remove the physical limitations at present imposed on the test pilot, for instance in climb tests and dives, the utility of mechanical recorders may well be further extended.

Aircraft Engineer Training

Recommendations by the S.B.A.C. Committee

THE Society of British Aircraft Constructors have for some time past had under consideration the importance of adequate and co-ordinated training in the aircraft industry and, as we announced recently, under the auspices of the Society a Sub-Committee of Apprentice Supervisors has met and evolved a set of recommendations for the training of aircraft engineering apprentices. These recommendations have now been accorded the approval of the Council of the Society.

The Committee are of the opinion that a more careful and scientific selection of apprentices is desirable and that the most useful men for the aircraft industry of the future can be obtained from a well-thought-out apprentice training scheme in which all firms in the industry would co-operate by planning their training schemes along similar lines. Such a scheme will produce men who will have had practical training in the workshops as well as theoretical training in technical schools and other educational establishments

From the general recommendations it appears that at each works there should be a Board of Interview, whose duties would include the selection of engineer apprentices from outside sources and from the firms' trade apprentices. Such a Board would, of course, have to consist of engineers of experience and understanding and could, for example, include the chief engineer, works manager and the firm's appointed apprentice supervisor.

No boy is to be admitted to an apprenticeship below the age of 16, and the training should not cease before the age of 21, but the Board may in exceptional circumstances admit a candidate who is older than 18 years and will arrange, if he is admitted to a shortened apprenticeship, that his standard of theoretical training will be correspondingly higher. Trade apprentices while undergoing training may prove by their ability that they are deserving of up-grading. Such outstanding apprentices should have the opportunity of transferring to the category of aeronautical engineering apprentice (aircraft or engines). Any trade apprentice who obtains the ordinary National Certificate should be considered by the Board of Interview for such up-grading.

Form of Indenture

Among the other recommendations put forward are that a form of agreement between the company, the apprentice and the parents of the apprentice should be provided upon the lines of the form published by the Engineering and Allied Employers' National Federation. Further, the practice of requiring premiums for apprenticeship training should be discontinued, and the apprentice should be paid the rates of wage agreed to by the above Federation. This appears to be a commendable recommendation in that the lad of capability with ambition and zeal to get on in the industry is no longer to be handicapped by the unfortunate financial circumstances of his parents. The minimum academic qualifications for apprentice aeronautical engineers should be the possession of one of the recognised School Certificates with credits in mathematics and a science subject. Consideration should, however, be given to applicants who have other approved qualifications, such as a diploma of a Junior Technical School.

Boys entering a works to take up an apprenticeship should undergo a probationary period of six months. At the end of his training, if his apprenticeship has been completed satisfactorily, the boy should be given a certificate to this effect. Whether, on the satisfactory completion of his apprenticeship, the applicant will be required to remain for a further period in the employ of the firm is not made clear, but it has been the custom with certain of the firms in the past to insist on retaining the services of an apprentice after the completion of his apprenticeship up to a period of two years; possibly this clause may still have to be included in the present proposals.

To ensure that he shall receive a sound engineering training, it is proposed that the apprentice should pass through all the engineering departments of the works and should spend not less than two-thirds of his apprenticeship in these departments, being moved from one section or department to another following a set syllabus in the following order:—

The Aeronautical Engineer Apprentice—Aircraft

(a) Pattern-making and foundry work (where available in the works or in a technical school in the locality).
(b) Fitting work. Detail fitting. Sub-assemblies and erection; engine installation.
(c) Machining. On all the usual types of machine tools in the works.
(d) Tool Room. It is desirable that all apprentices should pass through the tool room for a short period, say, three months, in order to acquire a knowledge of precision work
(e) Sheet metal work.
(f) Aircraft electrical installations.
(g) Bench equipment and jig assembly.
(h) Final erection.

Having passed through the general training referred to above, the apprentice should then receive a more specialised training in one or more of the following departments, according to his capabilities and inclinations:—

(i) Material testing and inspection.
(j) Experimental and research department.
(k) Laboratory.
(l) Design offices, or jig and tool drawing office.
(m) Rate-fixing department.
(n) Estimating and planning.

The Aeronautical Engineer Apprentice—Engines

This apprentice should pass through the following sections or departments:—

(a) Pattern making and foundry work.
(b) Machining. On all the usual types of machine tools in the works.
(c) Fitting and erecting work (all stages).
(d) Tool room. As for aeronautical engineering apprentice—aircraft engine testing.

Having passed through the above training, the apprentice, according to his capabilities and inclinations, may receive specialised training in one or more departments:—

(f) Material testing and inspection.
(g) Experimental and research department.
(h) Laboratory.
(i) Design offices, or jig and tool drawing office.
(j) Rate-fixing department.
(k) Estimating and planning.

Obviously not every firm in the aircraft industry will have all of these facilities for the training of apprentices, and it is suggested that arrangements should be made with other firms in the industry for transfer of apprentices. Such transfers might be arranged on a reciprocal basis with firms outside of the industry, and in this respect the S.B.A.C. will be prepared to assist. A most important feature of the scheme is that the Board of Interview may recommend in special cases that the apprentices should have the opportunity, by means of the S.B.A.C. Scholarship or by special assistance from the industry, to enter a Senior Engineering College or University, and in any case all engineering apprentices would be encouraged to join the Royal Aeronautical Society or the Institution of Production Engineers.

For theoretical and practical work, training schools established within the works and run by the firm are considered the best from the point of view of discipline, attendance and saving of time in travelling, etc., and the more general establishment of workshop schools is recommended.

AIRCRAFT ENGINEER TRAINING

When first entering a works, apprentices should be assured of training in the use of hand and machine tools, and should spend a minimum period of six months on this training before entering the works. Where it is not possible to arrange for a workshop school, arangements would be made for the apprentice to attend technical classes at the local institutes on one or two days a week. In this respect very satisfactory arrangements are already in force, and it is not considered practical nor desirable to discontinue the work already being done by these technical schools.

In view of this, and where circumstances dictate, an arrangement should be arrived at to dovetail the programme of works schools and technical schools in order to meet the full need of theoretical and practical training of each works in each locality. The exclusive use of evening classes as a means of technical instruction is considered unsatisfactory. Provision should therefore be made for daytime attendance at technical schools. Apprentices pursuing advanced courses of study, such as for the Final B.Sc.(Eng.) degree, or the Higher National Certificates, might well be given at least a day and a half for their studies.

In some places the local technical schools are close at hand and it is no hardship for boys to attend the classes provided. In other places these technical schools are at a great distance from the works, thus causing serious difficulties for the boys to attend classes. It is in places where the distances to the local technical schools are great that particular effort should be made to provide the technical education in a works school, and here the Board of Education are able to give certain assistance, details of which can be obtained from the Board of Education. The local Education Authorities also might be called upon to assist.

If satisfactory facilities exist in a technical school in the district, the theoretical training can be given in this school, and there should be co-operation between the works and the school so as to ensure that the theoretical work is directly associated with the practical work in the factory. For instance, the works could supply drawings, technical information and samples of construction to the technical school for the purpose of technical studies.

It is desirable to have a common syllabus of technical training, and a great amount of reorganisation is still called for in connection with the theoretical training to be given to apprentices in the various Government technical schools. There is a great variation in the facilities available in various districts, and there is also variation in the syllabus of training. Some schools are working in close co-operation with the aircraft or engine firm nearest to them, and a good standard of technical training is being imparted. In other places the facilities are not so good, and every effort should be made to improve them. The ideal curriculum should provide classes of instruction up to the standard of the Higher National Certificate in mechanical and production engineering.

With regard to production engineering, a Joint Committee of the Institution of Mechanical Engineers, the Institution of Production Engineers and the Board of Education has prepared and issued specimen syllabuses for the general guidance of those colleges and schools which wish to inaugurate the Higher National Certificate courses in production engineering. The pamphlets giving details of the syllabuses can be obtained from the Board of Education. This means that those apprentices who have a leaning towards management and production engineering should be able to obtain the necessary training and should be encouraged to take the Higher National Certificate courses which can be provided if the demand is sufficient.

Air Transport

Viscount Knollys Tells Empire Society What It Will Mean in the Future

LARGELY without the knowledge of the general public, the Royal Empire Society in Northumberland Avenue, London, is doing good work in cementing the bonds between the various members of the Empire. One aspect of the Society's activities which we on *Flight* particularly appreciate is the stress laid on the vital importance to the Empire of air transport. Of the weekly talks given by prominent men to the Society, quite a large proportion deal with some aspect of this subject. Last week the speaker was Viscount Knollys, chairman of British Overseas Airways Corporation, whose subject was "Air Transport in the Commonwealth and Empire." Lt.-Gen. Sir Frederick Sykes was in the chair.

Viscount Knollys gave a picture of what air transport means to the Empire now and in the future by first giving a brief account of his three recent tours over the routes of B.O.A.C., and then he visualised what air journeys to outlying parts of the Empire may involve in the future. The three tours covered the 50,000 miles of route of the Corporation and were: London to South Africa via Bathurst, Lagos, Kano, Khartoum, Lake Victoria, Nyanza, Nairobi, Mozambique, and Durban. Then back from Johannesburg to Cairo. The eastward tour was from Egypt to India, Australia and New Zealand. The homeward journey was via the Pacific, by the United States Air Transport Command, to San Francisco. Thence up to Vancouver and across Canada, and finally home by the B.O.A.C. Return Ferry Service.

In the second part of his talk, Lord Knollys pictured what it will probably be like when, after the war, the air passenger makes a journey to Australia and New Zealand. Leaving London for the airport, perhaps by helicopter, the passenger will step into a roomy aircraft of 50 tons or so, with Pullman comforts. The interior will be planned to make the best use of the space, and the colour scheme will be important. There will be a pressure cabin so that the passenger can fly in comfort at 20,000 or 30,000ft., and the machine will cruise at some 230 to 250 m.p.h.

Leaving London Friday night, at the end of a full week's work, the passenger will be served with his early morning cup of tea while looking out on the shores of the Eastern Mediterranean. A landing will be made for breakfast while the machine is refuelled and the bunks turned into day seats. Splitting up in Egypt, one set of passengers will reach India on Saturday night, while the other will arrive at Johannesburg on Sunday morning. The eastbound passenger will travel across India to Singapore and Australia, reaching Sydney on Monday morning in time for starting work there, or on to New Zealand some six or seven hours farther on.

That sort of journey, Lord Knollys said, will be for the man in a hurry. There will be others, more leisurely, who will prefer to stay a night or more here and there.

The lesson which Lord Knollys drew from his tours was that they were not in themselves remarkable (he took 60 days to girdle the world, although it could have been done in six), but the important feature was that in the 60 days he covered 37,000 miles, slept in 37 different countries, but spent only 210 hours in the air (equivalent to nine days), compared with seven weeks spent on the ground. That gave him time to see what was being done and to discuss wartime and future air transport problems at all the various places and with many different people. What air transport is going to mean to the Commonwealth is, Lord Knollys said, being clearly demonstrated at this moment by the Conference of Commonwealth Prime Ministers in London. Such meetings can be held anywhere and at short notice.

Research

Concluding Instalment of Seventh Wright Brothers Lecture to the Institute of the Aeronautical Sciences

By W. S. FARREN

(*Concluded from page 507, May 11th Issue*)

Stability and Control

Up to this point I have said nothing of the contribution of research to the production of stable and controllable aircraft. I am glad to say that the time is now long past when lack of stability is regarded by anyone as a virtue in an aircraft. In fact, it is unquestionably a most serious defect, whatever the duty of the aircraft. But it has always been difficult to define the necessary or desirable margins of stability and the associated general stability and control characteristics. The designer must, however, have the requirements expressed in terms that can be reflected in his layout, both as a whole and in detail. He must be able to judge fairly accurately how the changes inevitable as a design develops will react on the stability and control, and he must have at his disposal means of dealing economically with the consequences both of the variation of load distribution resulting from operational conditions and of the changes involved in the development of the aircraft.

There is a good deal about the stability and control of aircraft in which there has been little apparent change over the period covered by the examples I have taken. I believe, however, that this is simply because the desirable general characteristics were attained by about 1918. Since then our main problems have been, first, to preserve them substantially unchanged in spite of the profound changes in the form of aircraft, and, secondly, to enable the same man to control much larger and much faster aircraft.

The foundations of stability and control theory were laid, and well laid, long ago. Much labour has been spent on expanding it to embrace new developments, such as structural distortion and on the analysis of the controlled and uncontrolled motion of aircraft. A vast amount of experimental evidence has been accumulated. Much of this, however, is related rather to specific problems than to the systematic development of an understanding of the matter. There is room here for a wholesale improvement, particularly by an attack on a wider front in flight. I am not among those who criticise our record here on the grounds that we did not undertake enough basic work at the time when the airplane, as we now know it, first crystallised. I regret that circumstances made it impossible to give this work high priority. Had we been able to do so, we might have avoided many troubles and saved much labour. But I do not believe that, on the balance, we would have reached our objective—usable aircraft—more quickly. We relied on our past experience, on our ability to improvise, and—most significant of all—on our conviction that the theory available was soundly founded on experimental evidence. We discovered, by the attacks we were forced to make on troubles as they arose, much more about stability and control than most of us believed there was to learn. Thus, and I believe only thus, could we have advanced at the rate we did. It is an excellent example of the interworking of research and application.

Control Balance

In the field of control balance we have made tremendous advances in the face of difficulties that are sometimes hardly appreciated. The 1917 bombers operated at speeds—80 to 100 m.p.h.—at which the pilot could provide the forces necessary for control with little or no aerodynamic balance. Take the 0/400 ailerons. The maximum hinge moment required was probably equivalent to a force on the pilot's hand of the order of 50 lb., with ailerons on which the aerodynamic balance was probably no better than one-half. In the Lancaster the same movement of surfaces of about the same size is required at 300 m.p.h., requiring nine times the forces. The pilot is no stronger, so the aerodynamic balance must reduce the hinge moment to say one-eighteenth of that of unbalanced ailerons. This is a difficult requirement, but it has been met.

Suppose we put up the weight at the same wing loading to 100,000 lb., one and one-half times that of the Lancaster. The linear dimensions will rise in the ratio $1.5^{1/3}$ and the hinge moment at the same speed in the ratio $1.5^{2/3}$. The aerodynamic balance must therefore reduce the hinge moment in the ratio

$$\frac{1}{2 \times 1.5^{2/3} \times 3.^2} = \frac{1}{30}$$

A similar argument leads to a figure of 1/400 if the weight is increased to 500,000 lb. We can certainly achieve 1/30 and possibly 1/400 in ideal conditions. But it is doubtful whether this is a wise policy, since we can hardly expect to define or to maintain the shapes of surfaces sufficiently closely. Power-operated controls have been avoided so far, but it is unwise to assume that we can neglect them indefinitely. There seems to be no good reason to be doubtful of our ability to make them reliable.

Power Plant Developments

I do not propose to extend this survey to the two other main factors that have contributed to the changes we have seen in aircraft—the power plant and the airscrew. I have already quoted some figures that show how remarkably the reciprocating engine has advanced. I have also said that there have since been further advances, which, however, serve rather to emphasise the comparisons I have made than to invalidate them. This is because there have been accompanying changes in weight and other characteristics that leave the main conclusions substantially unaffected. Our debt to the engineers who, aided by research, have achieved these results is immense.

To the constant-speed airscrew the performance of aircraft must also acknowledge a great debt. But the flying man is even more grateful for what it has provided—almost complete freedom from his chief anxiety, namely, the liability to misuse his engine. We now look forward confidently to new methods of propulsion for aircraft. But I believe the airscrew has a long and useful future before it and one in which research will play an outstanding part.

The Task of Research

I trust that this short survey has gone some way to show why I am convinced that the research worker and the engineer must work together if we are to make significant progress. In his James Forrest lecture to the Institution of Civil Engineers in England, Dr. Southwell said that "aeronautical engineering is ordinary engineering made more difficult." If that was true in 1930, as I believe it was, it is more than ever true now. We can see clear prospects of great advances in aircraft in size, in performance, and in safety. The curve of improvement against time shows no real signs of flattening out. But we shall need all our ingenuity to avoid or to overcome the barriers which we can see ahead.

I think the engineer has made good use of the outstanding contributions of research for aeronautics. If at times he has appeared slow to appreciate the significance of new developments, he has a good excuse in his preoccupation with producing something on which we can rely. This is a sufficiently serious responsibility and one that he has borne with credit. But it is this very preoccupation that emphasises the need for employing as part of an engineering organisation men competent to detect those advances in knowledge which are potentially valuable and to work out the technique of applying them.

The research worker himself is not blameless in this respect. We can call to mind the case of Mendel, the significance of whose work in genetics was not recognised until he had been dead many years. His case is an example of discovery not appreciated because it is too far in advance of the general state of development of the science. Dr. Lanchester's books "Aerodonetics" and "Aerodynamics" contained much which may perhaps be regarded in the same way.

The instances I have mentioned may, of course, be regarded as classic examples of the difficulty of disseminating knowledge. As the volume of knowledge increases, this difficulty grows. But the research worker has, in my view, a part to play in "putting across" the results of research. It is reasonable to ask that he should put his results in such a form that they can be used. To those who feel that this is hardly worthy of so much of their time and attention, as it certainly demands if it is to be well done, I would commend the example of

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one of the greatest workers in aeronautics. Hermann Glauert. Every one of his outstanding contributions to aerodynamics was finished in such a form that the method of its application was made clear. I am not aware that this in any way detracted from the value of his work on whatever basis it may be judged. And I know, from my long and intimate friendship with him, that he regarded it as the natural method, and, indeed, the only one that would satisfy his sense of craftsmanship.

Problems of the Immediate Future

If this review leaves us confident of our powers to use effectively the results that an alliance between research and engineering ingenuity can provide, as I think it should, how should we shape our plans for the future? Let us look for a moment into what the future may hold for us in one field alone: still further improvement in performance—in speed and in range.

Within the limits of our present knowledge the most economical way to fly faster is to fly higher. Let us suppose that we can extend the range of operation of power plants so that propulsive power is independent of height. Taking an aircraft with the characteristics of the Spitfire (Table 1), and assuming that $C_{Do} = 0.022$ under all conditions, the curve of speed against height is shown in Fig. 7 labelled A. The line of sonic speed, Mach number = 1, is crossed at 65,000ft. In practice the effect of the compressibility of air begins to be felt at about M = 0.65 at 33,000ft. at a speed of about 430 m.p.h., and the rapid rise of C_{Do} with M brings the curve for greater heights down to about the level of curve A1. The loss of speed is very large.

If, by devising forms that will ensure some measure of laminar flow, we can halve C_{Do} and at the same time avoid compressibility effects, we get curve B. But if compressibility has the same kind of effect as on the original aircraft, the result will be to depress the speed to curve B1. Similarly, reducing C_{Do} to one-quarter of the original value, we get curves C and C1.

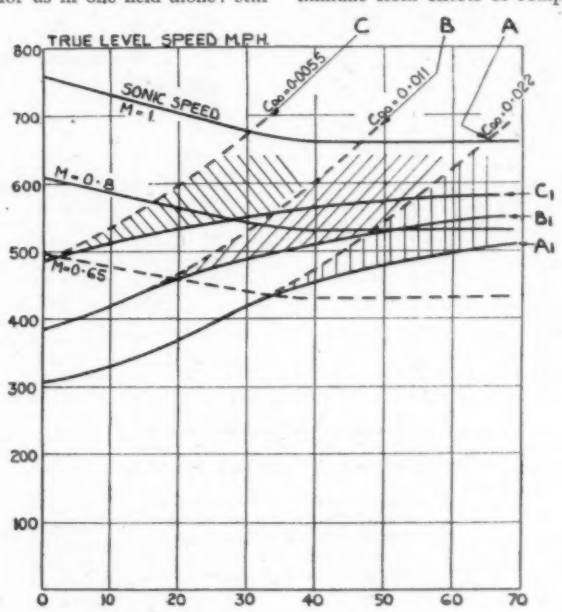

Fig. 7. True level speed vs. height, showing influence of reduction of C_{Do} and of compressibility. Propulsive power 4.5 T.H.P./sq. ft. of wing surface. Wing loading 28 lb./sq. ft. Aspect ratio 5.6.

If we are to reach really high speeds economically, it is clear that we must devote at least as much effort to avoiding or reducing the effect of compressibility as to reducing the "low-speed" value of C_{Do}. On the other hand, at speeds at which it is likely to be economical, to cruise for long distances, compressibility will for some time be relatively unimportant and laminar flow forms offer outstanding prospects. In round figures range and economical cruising speed are inversely proportional to the square root of C_{Do}. If we can halve C_{Do}, both range and cruising speed will rise by 40 per cent.

We must not dismiss too lightly the possibility of cruising economically, at great height, at very high speeds—speeds at which compressibility may well have a dominating influence on design. With a laminar flow extending over the majority of the surface of the aircraft we may reasonably expect to be able to cruise at 450 m.p.h.—a Mach number of about 0.7. Considering the airfoil alone, because of necessary thickness and camber, sonic speed will occur at a point near the surface when the lift coefficient reaches a certain value. Hence, the wing loading must not exceed a figure dependent on the height. At the heights at which it is likely that such speeds will be economical, from the power aspect, calculation suggests that rather low wing loadings will be required. Fig. 8 shows the results of some preliminary calculations on this point. The wing loading corresponding to the critical conditions is sensitive both to airfoil thickness and to height. For example, assuming 60 per cent. of laminar flow, 15 per cent. thickness and a camber appropriate to the lift coefficient, the critical wing loading at 35,000ft. is 28 lb. per sq. ft.; or for a 16 per cent. thickness 20 lb. per sq. ft. At 30,000ft. the corresponding loadings are 44 and 35. If these calculations are sound, the effect on the general economics of the situation will be marked. Here is another reason to justify extensive theoretic and experimental work in this field.

Thus we see both the barriers to progress which now face us and the potential rewards that will be ours if we can succeed in surmounting them. I return to my main theme—the research worker, the designer, the constructor and the user must join forces and, each fortified by the confidence and help of the others, plan the work that is needed to provide the informations, pursue the investigations in the conviction that the aim is worthy of the effort demanded, and apply the results to produce better aircraft.

From aerodynamics we demand not merely the bare solution of the problem of forms providing laminar flow, relatively immune from effects of compressibility. We require specific information covering the whole aircraft, including its propulsion, stability, and control. It may be that the whole layout of the aircraft will be different from that to which we have been accustomed. It is for the aerodynamics people to say, but they must base their opinions on a sound foundation of experiment.

From structural research we require to know what schemes of structural design are most likely to provide the necessary precision of form and superficial smoothness and how to cope with new strength and stiffness requirements. Aerodynamics must supply information on the loads that will be met in flight, and much thought must be given to the meteorologic conditions that will be encountered.

In the future it will be impossible to consider the aircraft engine and the aircraft as separate enterprises with conflicting requirements. The thermodynamic problems will be aerodynamic also. Their joint solution will throw up more than enough of the design problems at which the power-plant engineer excels.

Will the transformation of energy of the fuel into thrust demand an airscrew or a jet or a combination? There is no single answer. It will depend on the duty of the aircraft. But the airscrew designer will find that his task will tax all his ingenuity.

The Aircraft Designer's Task

Upon the aircraft designer will fall the burden of combining into a working proposition the contributions of all his collaborators. He will need to provide for pressurised cabins, ice-free surfaces, and the many indispensable aids to control, navigation, take-off and landing.

To the user the prospects are such that he should spare no pains in encouraging the research worker and the engineer in their difficult tasks. He must support them to the full in obtaining the resources in men and material, which will be essential for solving their problems. And he must contribute, as a member of the team, the operational information that will guide their efforts at all stages.

The experimental resources that such work demands are large. They must be generously planned to provide the greatest possible scope and flexibility. It will take time to devise and create them, and during this time we shall inevitably meet further difficulties whose exact nature we cannot yet foresee. We may be confident in our ability to adapt and to improvise, but we must ensure that the basic equipment is on an adequate scale.

I have left until last such remarks as I have to make on an aspect of planning research for aeronautics to which you may

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feel I should have paid more attention—namely, the organisation and management of the work on the scale that the scope and complexity of the problems demand. In what I said earlier I have emphasised my belief in the value of the independent small team of workers, who necessarily work on a small scale with relatively small equipment, and on one, or at most a few problems. But we must recognise, perhaps reluctantly, that we have problems to solve which cannot be handled successfully in that way.

It is not merely the large size and complexity of the equipment required which forces us to face the task of managing large research undertakings. It is rather that the many problems we must attack are interdependent, and that success in dealing with them depends on assembling and co-ordinating the efforts not only of a team but of many teams of workers. As in any large undertaking we have to break the work down into parts. Each part is the primary responsibility of a group of specialists under a leader. But the parts must be welded into a whole, and in this welding lies the problem of management.

I believe that the problem is best approached not from the top but from the bottom—from the point of view of the individual member of a team. What does he need in order that he may do the best that is in him? In my experience, he needs the following:

(1) A clear, unambiguous statement of the ultimate objective. This must be more than a statement of the specific problem. It must relate it to the general picture of which it is a part. Thus he will know *why* the work is being done.

(2) An opportunity to give his own views on the value of the underlying ideas. The basic plan must be, in part, his own. Thus he will start with a sound conviction that the plan is a good one.

(3) An immediate leader in whom he has confidence, who will inspire him, help him, and keep him up to date in all the relevant parallel work on related problems. Thus he will retain his original good spirits.

(4) Sufficient resources to enable his work to progress at what is, in his judgment, a speed commensurate with the importance of the objective. Thus he will feel that the value of his work is recognised in the only way that means anything to him.

This formula can, in my experience, be applied to groups of workers under a central management or to separate establishments under a central direction. And the difficulties that one meets in applying it arise not from its shortcomings but from conscious or unconscious neglect of its essentials.

Looked at in this way, such questions as the ideal size of research establishments cease to be of any great significance.

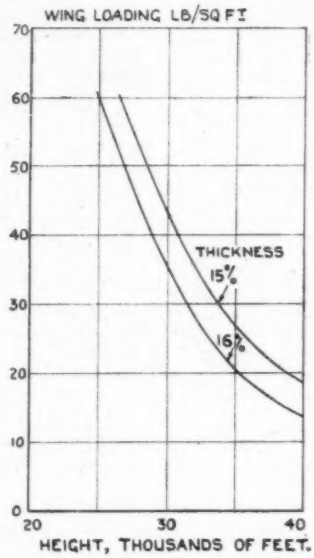

Fig. 8. Critical wing loading vs. height. True level speed 450 m.p.h. Flow laminar up to 60 per cent of cord. Aerofoil thickness 15 and 16 per cent.

Just as a team must have a leader who knows all about work being done by its members, so a group of teams must have a leader who is recognised by them to know enough about their work for him to be able to guide it to its common objective. The limit of economical size of a complete unit is set not by some arbitrary formula but by the simple fact that no one man can know enough about work in more than a few fields to be able to inspire real confidence in his team leaders or their teams. The control of large equipment, the management of numbers of skilled industrials, and the commonplace daily problems of facilities are matters of consequence, but they are not the real determining factors. I would summarise my views on this question as follows. There is no single or simple formula by which to determine the best method of handling research. But I believe there are a few simple principles in the light of which each particular situation may be viewed and a good solution found.

Conclusion

You will see that my experience has led me to the view that the record of science and engineering in aeronautics is a creditable one. It justifies us in demanding the means of extending our efforts into those new fields that we can now clearly see. The task of organising and managing the work, of devising and constructing the equipment, and, above all, of leading those upon whose efforts success will in the end depend is one of absorbing interest.

What the world will make of our efforts is a matter on which I regard it as unprofitable to speculate, at any rate here and at this time. I am an engineer in a world where good engineering, skilfully used, means survival and bad engineering means the end of what I believe to be a good way of living. So I am content for the time being to confine my efforts to the work in hand and to leave philosophic speculations on its value, on some absolute scale which I confess eludes me, to those who can find time or inclination for it. For this reason I have confined my attention primarily to research for aeronautics as used in war. There is another reason—I have spent the best part of my life on work with this as its first aim in the conviction that it had to be done.

But I am an incurable optimist. I believe that we shall succeed in our present effort—in which the share of research is to provide information by which aircraft and their equipment can be steadily improved and used to greater effect. When we have achieved our immediate aim, I do not doubt that much of our work will be put to uses that are more to my taste and to yours.

In the end, however, it is with the scientific and technical advances in the means of flight that we are here concerned. So far we have had a mere 40 years in which to show what we can do. It has been my purpose to point, in the light of my experience, to what we must do now to discharge the responsibility that is laid on us so that those who will follow us may find a fair field in which to explore the endless vista of opportunity which will lie before them

SHANNON AIRPORT DEVELOPMENT

SPEAKING of an increase in the vote for Public Works in his recent Budget speech the Eire Minister for Finance (Mr. Sean T. O'Kelly) said that the increased provision was almost entirely due to works at the Shannon Airport. It was clear, he added, that the complete development of the airport, on which much money had already been spent, would be extremely costly, but it must be realised that the airport had to be established and equipped on modern lines if it was to attain, after the war, the importance as a centre of international civil aviation for which they hoped.

According to the Eire Public Service Estimates for the current financial year, a sum of £1,792,000, of which £27,240 is a revote, is required for the provisional estimate for works at the Shannon Airport. A sum of £148,000 (provisional estimate), of which £34,000 is a revote, is required for the Foynes flying-boat anchorage, and there is a provisional estimate of £389,000 for the Dublin Airport, the full sum in this case being a revote. The total estimated expenditures on these three projects up to March 31st last was as follows:—Shannon airport, £588,000; Foynes flying-boat anchorage, £24,000; Dublin airport, £361,500. Amounts required to be voted for 1944-45 are £400,000, £108,000 and £2,500 respectively.

A.T.C. EXHIBITION ON TOUR

NEARLY 750,000 people have now seen the Air Training Corps exhibition—"A.T.C. Calling"—which is now at Preston, Lancs. Opened at Harrods last December by Sir Archibald Sinclair, Secretary of State for Air, "A.T.C. Calling" has since visited Hammersmith, Doncaster, Leeds and Edinburgh. After Preston the exhibition will be seen in Blackburn, Morecambe and Northampton.

Thousands of budding aircrews have been given "flights" in the Link Trainer, and a specially wired-up Lancaster bomber fuselage. New exhibits include modern Rolls-Royce and Bristol engines.

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The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

A.T.C. OFFICERS' DRESS

Dissention Deprecated

MAY I be permitted to reply to your correspondent, Leonard Taylor (Editor of the *A.T.C. Gazette*), *vide* issue of *Flight* dated May 4th under the heading "A.T.C. Officers' Dress."

One is getting somewhat tired of the childish reference of some people to this matter. Surely it is time the whole question was dropped once and for all.

The Air Ministry has already bowed to the pleadings of the aggrieved and permitted the use of the G.S. cap "off duty," which should meet the case.

Anyhow, how about the Home Guard: is he any different?

I have been an officer in the R.A.F.V.R. (T.R. branch) since the commencement and before that in the A.D.C.C.

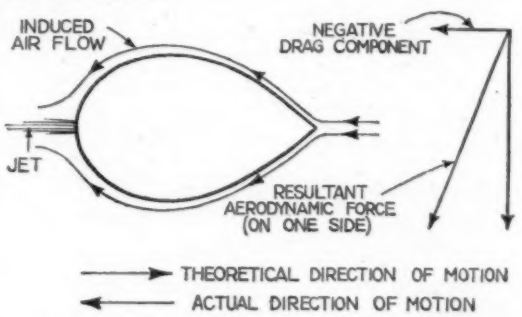
I am very proud of the Corps, and its achievements. Let us not permit therefore attempts at dissention within our ranks.

"CANDIT."

THE DUCTED RADIATOR

Phenomenon with Ovoid Body

REFERRING to Mr. Shoham's reply (*Flight*, April 20th) to Squadron Leader Brotherton's letter concerning the forces on a Townend ring, it is interesting to observe the action of an ovoid body with a gaseous jet issuing from the blunter end. According to the laws of jet reaction, the body should move in the opposite direction to the jet. Actually it tends to move in the same direction.



This phenomenon is explained by the fact that the jet induces a flow of air over the surface of the body, and this in turn produces aerodynamic forces similar to those on the Townend ring (though in this case the air flow is in the reverse direction).

H. HONE, B.Sc.

GUNPOWDER AS A FUEL

Not a Question of Calorific Value

I KNEW it would happen! The moment I saw that you had published my letter advocating the use of gunpowder to drive *motors* under the section of Correspondence on jet propulsion of aircraft (*Flight*, March 16th) I knew I should be called upon to deal with hot air.

But it is not a question of calorific value, and Mr. Ogston (*Flight*, April 13th) is thrusting up the wrong duct.

I suggested the use of gunpowder specifically for "fan-driven" aircraft, as I fondly believe anyone who bothered to read beyond the title could see. Indeed, I am grateful to Mr. Gould (*Flight*, March 30th), who both read and understood my suggestion, for getting straight to the point and talking of "producing pressure in, say, a locomotive boiler." Incidentally, I am also grateful for his confirmation that "gunpowder should give better expansive economy than spirit."

Mr. Ogston, on the other hand, is thrusting his B.T.U. in a vacuum; and strangely (as one would expect) helping us forward at a mighty rate—for he has confirmed my previous opinion that overheating could certainly not be held up as an objection to the use of gunpowder as a pressure medium; in fact, his figures quite simply show that a pound of gunpowder will, on burning, produce only one-fifteenth of the heat produced by a pound of petrol—this after Mr. Gould had confirmed that the same pound of gunpowder has decidedly more "piston-pushing value" than a pound of petrol. By the way, it is the very fact that gunpowder does not rely on the atmosphere, which lends the argument its strength.

And so the only objection is Mr. Gould's; to wit, that it is the cost of gunpowder which is the ruling factor.

So could somebody who knows please tell me:

(1) The actual difference in cost of gunpowder and petrol, weight for weight, as mass-produced to-day; and

(2) the actual difference in expansion upon combustion—which seems to be the only criterion involved in this particular case.

And, for those who missed what went before, may I again briefly state the case: A machine-gun-cum-boiler providing the pressure to drive the engine, at a great saving in fuel-weight; independence of atmosphere; with a pressure-medium as non-inflammable as steam; and (so long as the "boiler" has not leaked overnight) instantaneous starting up even at the North Pole.

"DRIVER."

INFORMATION LEAKAGE

"Gen" from Unofficial Sources

SOME of your correspondents have lately accused the A.T.C. of giving away information on secret aircraft types and of receiving more "gen" than the R.O.C. The first charge may be true, as the average age of the Corps is fairly low, and not every cadet is security-minded. I do deny, however, that they obtain this information through A.T.C. official channels. R.A.F. personnel and sometimes members of Spotters' Clubs are very ready to give information to anybody interested, as we are.

In my three years as an A.T.C. cadet I have never seen an Air Ministry recognition handbook, though G. A. B. Short states that these are "often" left at the disposal of cadets, and the small amount of secret information I have received has been harmless stuff (e.g., Warwick) which was published within a few weeks.

Incidentally, cadets are *not* allowed to enter operational types except in the case of machines under repair and stripped of operational equipment.

It is probable that any "gen" given away by the A.T.C. has already been distributed through the medium of careless R.A.F. and N.A.S.C. members, from whom I, for one, have learned much about the latest aircraft types.

E. G. FARMAN (Cadet).

SORTING OUT THE SNAGS

Retests Not So Numerous

JUDGING by "Test Pilot's" remarks (*Flight*, April 20th) on my reply to "Indicator's" article relating to "Sorting Out the Snags," I should imagine that either he is the type who is fond of a second flight, or that he has been extraordinarily unlucky. If on the other hand the percentage of required retests are as high as he quotes I would say that it is high time that something was done about it.

With regard to the undercarriage failing, this would be an extremely serious matter, as I refuse to believe that it could be caused by the airflow pressure under normal conditions. The pressure available at the hydraulic ram far exceeds the air pressure exerted on the unit due to airflow. I can understand the tell-tales sticking after inspection if they are of the bead type, but the electrical contact type have eliminated this snag.

Perhaps "Test Pilot" refers to the occasion when the unit has been subjected to excessive taxying tests, due to a hare getting up, resulting in excessive strain and malalignment prior to take-off!

The snag with the directional gyro is that in the case of military aircraft, with which I presume "Test Pilot" is also concerned to-day, this unit is invariably received in situ on the blind flying panel on embodiment loan and as such is fitted *en bloc*, no test being carried out other than to see that the vacuum pump causes the turn and bank gyro to right itself on engine run. From the time this sub-assembly is tested to the time of flight test, considerable transportation has taken place and frequently the balance of this unit has

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been upset. As "Test Pilot" may or may not be aware, units of this description issued to the airframe manufacturers, etc., are sealed, and their rectification is not permitted by the installation personnel, the unit having to be replaced and returned with the seal unbroken. In view of the fact that test flights are carried out—or should be—within the precincts of the airfield and not under actual blind flying conditions, and that the safety of the aircraft during this flight would not be impaired by the unserviceability of the unit, it would clearly be uneconomical to employ additional time, material and personnel in having to check the assembly immediately prior to test flight when this test itself can do the work instead; after all, test pilots other than the chief, usually have a fairly easy time.

I do not think there is any necessity to go into further detail, or need to refer to Gremlins, for, after all, I do not wish to become a voluntary consulting "ground engineer," but I would like to feel that "Test Pilot" if that is his profession as well as his *nom de plume*, had a little more confidence in his associates than he would have us believe.

W. D. BLACKBURN.

DAY AND NIGHT RAIDS

Striking Often as Well as Hard

THERE are one or two statements made by V. H. Izard in his letter which appeared in *Flight* on April 6th, as to the advantages of daylight raids over those carried out by night, to which I would like to add some remarks.

In my view, this correspondent made a most regrettable statement when he wrote "I see no reason why *all* bombing should not be by day in the near future." I see no reason why it should! Our policy, broadly, is to hit the enemy as hard and as *often* as possible, so why throw away opportunities of striking blows by night?

As Mr. Izard says, there must inevitably be some civilian casualties in occupied territory, in air attacks by day as well as night, but I maintain that R.A.F. night attacks, especially on French industrial targets, are highly accurate even though, on most occasions, conditions are not as favourable as are met with in daylight. 12,000 lb. "factory-busters," together with "block-busters" and "cookies," are dropped with great precision by our Lancaster crews on a variety of special targets of strategic importance inside the occupied countries, and most people interested in R.A.F. activities probably read how an R.A.F. bomber brought back its deadly load of more than 5 tons of high-explosive because the crew could not be certain of hitting the target squarely. This is only one instance which demonstrates the standard reached in night precision bombing.

The numbers of enemy fighters destroyed by U.S. Fortresses and Liberators, with their powerful fighter escorts, is, indeed, considerable. That one fact alone dispels any argument against maintaining these daylight air attacks on Germany's "European fortress," but if sufficient forces of day bombers are operating to cope with and reduce the *Luftwaffe* fighter strength, as appears to be the case now, then what an advantage would be gained by supplementing our own night bomber production with that of some American factories, in view of the greater tonnage of bombs which can be carried by night bombers. If we can imagine a time when *Luftwaffe* strength is reduced to such an extent as to allow the present types of night bombers to attack by day, then I believe that Germany's end will be very near indeed. Although a depreciating factor, the *Luftwaffe* shows no signs of having to be written off as an effective counter-weapon to Allied raiders.

There are, we know, certain disadvantages accompanying night attacks, such as those which your correspondent mentions. So there are where night work is done in war factories, but there is no "let-up" in round-the-clock production. Nor must there be in round-the-clock bombing.

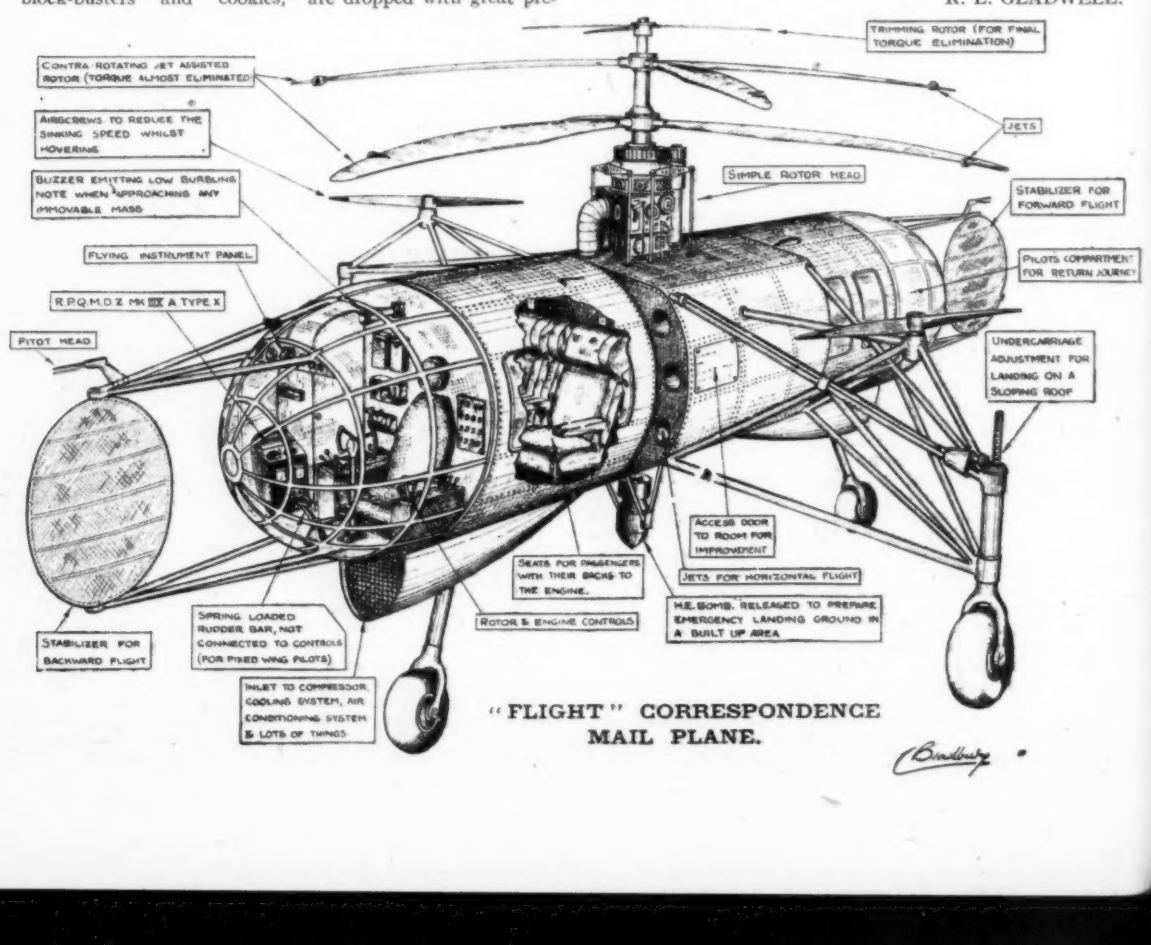
While on the subject of day raids, I would like to offer an answer to "Realist" (*Flight*, April 6th) on the question of Fortress or Mosquito for day raids.

First, whereas the Mosquito carries a bomb-load of 4,000 lb., the Flying Fortress carries at least 5,000 lb. of bombs, and the Liberator about 9,000 lb. Thus there is a greater bomb-carrying capacity for the "Fort" and Liberator.

Also, even with powerful fighter escort, the U.S. "heavies" are subjected to fierce opposition from intercepting enemy fighters, as is shown by the numbers of the latter shot down. Then, again, the U.S. bombers have a dual function: that of destroying German strategic targets *and* of reducing German fighter strength, though the latter may not be an officially stated duty of the bombers.

With these points in mind, the continued use of Fortresses and Liberators seems to me to be well justified, though I agree that Mosquitos, working in conjunction with the bigger bombers, would no doubt be able to do valuable work.

R. L. GLADWELL.


TRIMMING ROTOR (FOR FINAL TORQUE ELIMINATION)
CONTRA-ROTATING JET ASSISTED ROTOR (TORQUE ALMOST ELIMINATED)
AIRSCREWS TO REDUCE THE SINKING SPEED WHILST HOVERING
JETS
BUZZER EMITTING LOW BURBLING NOTE WHEN APPROACHING ANY IMMOVABLE MASS
SIMPLE ROTOR HEAD
STABILIZER FOR FORWARD FLIGHT
FLYING INSTRUMENT PANEL
PILOTS COMPARTMENT FOR RETURN JOURNEY
R.P.Q.M.D.Z MK IIIX A TYPE X
PITOT HEAD
UNDERCARRIAGE ADJUSTMENT FOR LANDING ON A SLOPING ROOF
ACCESS DOOR TO ROOM FOR IMPROVEMENT
SEATS FOR PASSENGERS WITH THEIR BACKS TO THE ENGINE.
JETS FOR HORIZONTAL FLIGHT
H.E. BOMB. RELEASED TO PREPARE EMERGENCY LANDING GROUND IN A BUILT UP AREA
ROTOR & ENGINE CONTROLS
SPRING LOADED RUDDER BAR, NOT CONNECTED TO CONTROLS (FOR FIXED WING PILOTS)
STABILIZER FOR BACKWARD FLIGHT
INLET TO COMPRESSOR. COOLING SYSTEM, AIR CONDITIONING SYSTEM & LOTS OF THINGS

"FLIGHT" CORRESPONDENCE MAIL PLANE.

HEAVIES IN ITALY : Halifax IIs, which have done such good work over the Balkans, standing on a Marston strip runway on an Italian airfield. The Ju88 tailplane in the foregound makes a useful table.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Appointments

AIR VICE-MARSHAL T. M. WILLIAMS, C.B., O.B.E., M.C., D.F.C., to be Deputy Commander, Headquarters, Eastern Air Command. (Air Command, South East Asia.)

Air Vice-Marshal Williams has been Senior Air Staff Officer, H.Q. 3rd Tactical Air Force, Air Command, South East Asia, since November, 1943. He had previously been Air Officer Commanding Headquarters, Bengal.

Air Vice-Marshal G. E. GIBBS, M.C., to be Senior Air Staff Officer, Headquarters, 3rd Tactical Air Force, Air Command, South East Asia.

Air Vice-Marshal Gibbs has been Director of Special Air Staff Plan, Headquarters, Air Command South-East Asia, since December, 1943. He was previously Director of Overseas Operations, Air Ministry, and served on special duties in the Department of the Air Member for Supply and Organisation. In 1940 he was Senior Air Staff Officer at No. 11 Group.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy :—

Bar to Distinguished Service Order

Act. Wing Cdr. B. R. O'B. HOARE, D.S.O., D.F.C., R.A.F.O., No. 605 Sqn.—This officer has participated in more than 100 sorties, involving attacks on airfields in Germany, Belgium, Denmark, Holland and France escorts to bomber formations and a variety of other missions. He is a magnificent leader, whose personal example of courage and devotion to duty has inspired all. In addition to his activities in the air, Wing Cdr. Hoare has devoted much of his energy and skill towards the training of other members of the squadron, with excellent results. This officer, who has destroyed at least eight enemy aircraft, has rendered most valuable service.

Distinguished Service Order

Act. Wing Cdr. R. N. BATESON, D.F.C., R.A.F.O., No. 613 Sqn.—This officer has displayed the highest standard of skill and leadership throughout the many and varied sorties in which he has participated. In April, 1944, Wing Cdr. Bateson flew the leading aircraft of a formation detailed to attack a target in Holland. The operation, which demanded a high degree of courage and determination, was completed with success and reflects the greatest credit on the efforts of this officer, whose leadership was outstanding. His achievements have been worthy of great praise.

Sqn. Ldr. L. H. ENO, D.F.C., R.A.F., No. 51 Sqn.—This officer has completed many sorties on his second tour of operations, and his continued good work has won great praise. In recent operations Sqn. Ldr. Eno has attacked many targets, including Dusseldorf, Stuttgart, Magdeburg and Berlin. He has at all times displayed great courage and determination, and his example has impressed all. In addition to his work in the air, Sqn. Ldr. Eno has rendered valuable service in the training of other members of the squadron.

Sqn. Ldr. A. D. PHILLIPS, D.F.C., R.A.F., No. 248 Sqn.—This officer has completed a large number of sorties, many of which have demanded a high degree of skill and resolution. Recently Sqn. Ldr. Phillips flew the leading aircraft of a formation which attacked an enemy naval force escorted by fighters. In the fight a U-boat and a surface vessel were hit, while three of the escorting aircraft were shot down, one of them by Sqn. Ldr. Phillips. This officer displayed fine qualities of leadership throughout and pressed home his attack with great determination. He played a good part in the success achieved. He has invariably displayed great courage and devotion to duty.

Prince Bernhard decorating Wing Cdr. R. N. Bateson with the Dutch Flight Cross. Wing Cdr. Bateson, D.S.O., D.F.C., led the zero level attack on the "one house" target in the Hague. The citation for his D.S.O. appears on this page.

Wing Cdr. A. E. CLOUSTON, D.F.C., A.F.C., R.A.F.O., No. 224 Sqn.—Wing Cdr. Clouston has rendered sterling service as commander of his squadron for the past twelve months. During this period his squadron has attained a very high reputation for efficiency in the campaign against enemy submarines. Wing Cdr. Clouston has taken part in numerous sorties with different crews and on five occasions has experienced attacks by enemy aircraft. He has also participated in attacks on U-boats. The energy, example and experience of this officer have been of the greatest value to his squadron.

Bar to Distinguished Flying Cross

F/O. M. S. ALLEN, D.F.C., R.A.F.V.R., and F/O. H. E. WHITE, D.F.C., R.A.F.V.R., both of No. 141 Sqn.—As observer and pilot respectively these officers have completed many sorties since being awarded the D.F.C. They have set a fine example of keenness and devotion to duty throughout, and have now destroyed at least five enemy aircraft at night. Their achievements have been worthy of much praise.

Flt. Lt. A. J. GLEGG, D.F.C., R.A.F.V.R., No. 219 Sqn.—Since being awarded the D.F.C. this officer has been responsible for the destruction of a further seven enemy aircraft. Now on his second tour of operational duty, he has consistently displayed a high degree of efficiency and courage. Flt. Lt. Glegg has also been untiring in his efforts in training new observers, playing no small part in the high standard maintained by his unit.

Act. Sqn. Ldr. A. U. HOULE, D.F.C., R.C.A.F., No. 417 (R.C.A.F.) Sqn.—This commanding officer has served throughout the Sicilian and Italian campaigns. An excellent leader and skilful pilot, he has always evinced a fine fighting spirit, determination and courage. During the course of the fighting in Italy Sqn. Ldr. Houle destroyed five enemy aircraft, bringing his total victories to at least nine destroyed and others damaged.

F/O. L. W. CURTIS, D.F.C., R.A.F.V.R., No. 617 Sqn.—As wireless operator, this officer has completed numerous sorties since being awarded the D.F.C. His work has been of a high standard throughout, and has played a good part in the many successes obtained. He is a most dependable member of aircraft crew, whose exemplary conduct in the face of the enemy is worthy of the greatest praise.

SERVICE AVIATION

Maj. M. S. OSLER, D.F.C., S.A.A.F., No. 601 Sqn.—Maj. Osler has commanded his squadron since August, 1943. He has led a large number of highly successful low level attacks, inflicting considerable damage on enemy locomotives and mechanised transport. He has also destroyed eight enemy aircraft in air combat, and at least four others on the ground. On one occasion this officer led an attack on a petrol train, destroying 120,000 gallons of spirit. At all times Maj. Osler has displayed a fine fighting spirit and outstanding devotion to duty.

Distinguished Flying Cross

Sqn. Ldr. B. E. PECK, R.A.F.O., No. 120 Sqn.
Sqn. Ldr. G. W. PETRE, R.A.F., No. 193 Sqn.
Act. Sqn. Ldr. J. H. REEVE, R.A.F.V.R, No. 107 Sqn.
Act. Sqn. Ldr. D. G. ROSS, R.A.F.V.R., No. 263 Sqn.
Act. Sqn. Ldr R. A. SUTHERLAND, R.A.F.O., No. 602 Sqn.
Flt. Lt. M. CHARLTON, R.A.A.F., No. 59 Sqn
Flt. Lt. A. CODY, D.F.M., R.A.F., No. 216 Sqn.
Flt. Lt. P. J. CROWLEY, R.A.F., No. 226 Sqn.
Flt. Lt. J. F. CUTHBERT, R.A.F.V.R., No. 216 Sqn.
Flt. Lt. C. M. GIBBS, R.N.Z.A.F., No. 267 Sqn.
Flt. Lt. B. GRIMSHAW, R.A.F.V.R., No. 228 Sqn.
Flt. Lt. D. R. HAWKES, R.A.F.V.R., No. 455 (R.A.A.F.) Sqn.
Flt. Lt. D. W. LEWIS, R.A.A.F., No. 454 (R.A.A.F.) Sqn.
Flt. Lt. R. C. LUCK, R.A.F.V.R., No. 209 Sqn.
Flt. Lt. P. C. PRIDMORE, R.A.F.V.R., No. 216 Sqn.
Flt. Lt. W. G. RAILTON, R.A.F.V.R., No. 454 (R.A.A.F.) Sqn.
Act. Flt. Lt. R. F. P. LYON, R.A.F.V.R., No. 88 Sqn.
Act. Flt. Lt. J. G. ROWAND, R.C.A.F., No. 404 (R.C.A.F.) Sqn
Act. Flt. Lt. K. G. TAYLOR-CANNON, R.N.Z.A.F., No. 486 (R.N.Z.A.F.) Sqn.
F/O. R. C. BAKER, R.A.F.V.R., No. 120 Sqn.
F/O. J. B. BRODIE, R.A.F.V.R., No 220 Sqn.
F/O. F. J. DEEKS, R.A.F.V.R., No. 107 Sqn.
F/O. R. A. DOUGLAS, R.A.F., No. 216 Sqn.
F/O. J. F. GREEN, R.A.F.V.R., No. 248 Sqn.
F/O. R. A. HOSKING, R.A.A.F., No. 540 Sqn.
F/O. V. H. LINTHUNE, R.A.F., No. 25 Sqn.
F/O. J. W. MOORE, R.A.F., No. 107 Sqn.
F/O. A. K. MURDOCH, R.A.F.V.R., No. 216 Sqn
F/O. G. PLATTS, R.A.F.V.R., No. 541 Sqn.
F/O. A. N. SAMES, R.N.Z.A.F., No 468 (R.N.Z.A.F.) Sqn.
F/O. D. P. TAYLOR, R.A.F.V.R., No. 216 Sqn.
F/O. T. A. VANCE, R.A.A.F., No. 165 Sqn.
P/O. D. V. PAUL R.A.A.F., No. 454 (R.A.A.F.) Sqn.

Distinguished Flying Medal

Sgt. G. H. HAMMOND, R.A.F.V.R., No. 179 Sqn.
Flt. Sgt. K. HALL, No. 12 Sqn.
Sgt. J. C. CLARK, No. 166 Sqn.
Flt. Sgt. (now P/O.) F. L. R. LLOYD, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Sgt. C. L. SPINK, R.A.F.V.R., No. 103 Sqn
Flt. Sgt. R. W. BARRETT, A.A.F., No. 120 Sqn
Flt. Sgt. K. V. ERRINGTON, R.A.F., No. 215 Sqn
Flt. Sgt. W. A. JOHNSON, R.A.F.V.R., No. 502 Sqn.
Sgt. E. WASS, R.A.F.V.R., No. 202 Sqn.
Flt. Sgt. G. C. FERGUSON, R.A.F.V.R., No. 158 Sqn
Flt. Sgt. N. GAMBLE, R.A.F.V.R., No. 158 Sqn
Flt. Sgt. T. W. J. HALL R.A.F.V.R., No 106 Sqn
Sgt. H. HULME, R.A.F.V.R., No. 158 Sqn.
Sgt. D. J. JONES, R.A.F.V.R., No. 158 Sqn.
Sgt. R. ROONEY, R.A.F., No. 640 Sqn.
Flt. Sgt. D. SCHOFIELD, R.A.F.V.R., No. 619 Sqn
Flt. Sgt. G. E. HEXTER, R.C.A.F., No. 619 Sqn
Sgt. A. E. HARRIS, R.A.F., No. 61 Sqn.

THE KING has been graciously pleased to approve the following awards with effect from March 30th, 1944, in recognition of gallantry displayed in flying operations against the enemy in the South-West Pacific area:—

Distinguished Flying Cross

Flt. Lt. J. F. RUSSELL, R.A.A.F.
W/O. C. W. BAILEY, R.A.A.F.

The King has been graciously pleased to approve the following award:—

Distinguished Service Medal

L.A/C. A. P. WHITE.—This airman has participated in a number of rescues and has always been an exceptionally seamanlike and zealous member of the crew of his launch. In June, 1942, he showed great determination when assisting to get four badly wounded men from the wardroom of a sinking motor torpedo boat. It was necessary to lash the men to stretchers, which made it a difficult operation to get them out of the wardroom. Subsequently an attempt was made to tow the sinking boat to port and in this L.A/C. White assisted with skill. On another occasion, during the combined operations at Dieppe, this airman's launch was attacked by enemy aircraft and casualties were sustained. Nevertheless, he, with other members of his crew, boarded another launch, which had also been attacked and moved the injured members of its crew to his own launch. Later, when the launch was sunk, L.A/C. White sustained the crew by his fortitude and cheerfulness. He is a splendid seaman who has shown great keenness and devotion to his duties.

Roll of Honour

Casualty Communiqué No. 383.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 154 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. S. Barker; Sgt. G. Cannock; Sgt. J. E. Carrott; Sgt. C. T. L. Clement; Flt. Sgt. F. S. Cooke; Sgt. J. A. Davis; P/O. J. E. Derbyshire; Sgt. W. A. Geraghty; Sgt. D. Haydock; F/O. A. R. Hurley; Sgt. J. W. Linfoot; Flt. Sgt. S. P. Morris; F/O. N. Munro; Sgt. G. E. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. H. L. J. Aitchison; Flt. Sgt. F. Bullock; Sgt. H. Chadwick; Sgt. F. G. Chapman; Sgt. C. B. Edwards; Sgt. S. MacDonald; Sqn. Ldr. G. H. Norton; Sgt. J. L. Oldershaw; P/O. F. F. Pepper; Sgt. E. Whitfield.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. B. Aitken; Sgt. N. H. Apperley; Sgt. S. Arthur; Sgt. R. Barneveld; Sgt. B. J. Barton; Sgt. T. G. Barton; Sgt. F. Bettridge; P/O. P. E. Bevis; Flt. Sgt. F. Birkin; Sgt. J. W. S. Birrell; F/O. W. R. Booker; Sgt. K. Broadhurst; Sgt. E. W. H. Browne; Sgt. W. Bruce; Sgt. J. D. G. Bunker; F/O. C. Burne; Sgt. H. Butler; P/O. R. K. Buxton; Sgt. A. A. Caley; P/O. W. H. Clague; Sgt. H. A. Clark; Sgt. N. W. H. Clark; Sgt. R. J. Cockshott; Sgt. P. R. Collins; Sgt. R. H. Connor; Sgt. B. G. A. Cooper; Sgt. R. A. Cooper; Sgt. R. D. Copley; Wing Cdr. J. Coverdale; Sgt. S. Cowgill; Sgt. J. R. Cranham; Sgt. L. W. Davies; P/O. G. M. M. L. De Meillac; Sgt. J. Douglas; Sgt. A. E. Downs; Flt. Lt. C. W. Dunnet; Sgt. F. A. J. Edwards; F/Of. S. J. Elphick; Sgt. J. H. Emmett; P/O. J. C. Evans; Sgt. C. H. Fenton; F/O. F. E. Fielding; Sgt. M. J. Fitzgerald; Sgt. M. J. Flaherty; Sgt. J. Foggon; Sgt. J. A. Francis; Sgt. R. Franklin; Flt. Sgt. F. B. Garrett; Sgt. R. E. Gray; Flt. Sgt. C. E. Gregory; Sgt. F. Grey; Act. Flt. Sgt. R. Grundy; Sgt. A. E. Gurney; Sgt. R. Hadley; P/O. F. J. Haines; Sgt. A. D. Hall; Sgt. L. C. Hayward; Sgt. C. C. Holden; Sgt. E. Honeybill; Sgt. J. Innes; Sgt. L. J. A. Jacques; Sgt. F. C. Kingston; Sgt. A. C. Lockenby; Sgt. E. F. Lawrence; Sgt. A. F. B. Leonard; Sgt. L. O. Lewington; Sgt. G. A. Lilley; Sgt. H. C. MacAninch; Sgt. D. McM. McCullock; Sgt. A. P. McGinley; F/O. W. B. McGinn; Sgt. W. McGuire; Sgt. R. D. McKeown; Sgt. R. McWilliams; F/O. K. Marsland; Sgt. P. E. Mellish; Sgt. H. B. Mellor; Sgt. P. W. Mitchell; Sgt. R. A. W. Morse; F/O. W. E. L. Morse; Sgt. J. J. Newbon; Sgt. J. Orr; Sgt. A. Osmond; Sgt. J. E. Owen; Wing Cdr. J. J. Owen; P/O. J. W. Palmer; Act. Flt. Lt. M. Parry; P/O. G. C. W. Parslow, D.F.M.; F/O. R. E. Parsons, D.F.M.; Sgt. E. V. Pass; Sgt. G. E. Patrick; P/O. A. McL. Penman; F/O. W. H. J. Pickard; Sgt. R. W. Pluck; Sgt. T. G. Porter; Act. Sqn. Ldr. A. S. Raphael, D.F.C.; P/O. J. F. Ray; Sgt. C. Reddell; Flt. Sgt. R. E. J. Rees; Flt. Sgt. R. P. Reynolds; F/O. S. Q. Robinson; Sgt. S. D. Rollinson; Sgt. A. McG. Saniars; Flt. Sgt. J. A. Saunders; Sgt. R. K. Scott; Sgt. J. Sellers; P/O. H. M. Smith; P/O. A. C. Stephens; P/O. W. J. Stephen, D.F.M.; P/O. D. MacL. Struthers; F/O. E. H. Swain; Sgt. D. Telfer; Sgt. R. E. Thallon; Sgt. J. Thomas; Flt. Sgt. F. G. Thomson; Sgt. H. J. Toze; Sgt. G. I. Turnbull; Sgt. H. G. C. Waite; Act. Wing Cdr. P. G. H. Warner, D.S.O.; Sgt. A. L. Warren; F/O. A. G. McA. Watson; Sgt. J. A. Whetton; Sgt. P. D. White; Sgt. T. W. A. Wilkes; Sgt. R. Wilkinson; Sgt. J. G. V. Williams; Sgt. G. E. Wilson; Sgt. E. Wright.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. W. E. Harbidge.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. C. V. Clarke; P/O. W. G. Davies; Sgt. W. Rees; F/O. K. J. Tubbs.

MISSING.—Flt. Sgt. A. J. Barnett; Sgt. W. A. Bates; Sgt. J. K. Boothroyd; Sgt. H. F. Bore; Act. Flt. Lt. E. Brown; F/O. J. W. Bryan; Flt. Sgt. H. F. Buckingham; Sgt. J. E. Chapman; F/O. A. O. Colan; Sgt. W. H. Cotterill; Sgt. T. B. Cowley; Sgt. W. Craig; Act. Flt. Lt. B. Denman; Flt. Sgt. J. W. Devenish; F/O. C. S. Duncan; W/O. J. Dunlop; Sgt. J. McC. Dunlop; Sgt. K. McL. Fairbairn; Sgt. C. S. Foster; Sgt. B. R. Garfield; Flt. Sgt. A. T. Garrett; Sgt. E. H. Glibbery; Sgt. G. E. Greenwood; P/O. J. C. Grindrod; P/O. D. J. Hoad; Sgt. J. C. Holbrook; Sgt. S. G. Hubbard; Sgt. M. A. Hutchinson; F/O. S. A. Isham; Sgt. S. D. Jeavons; Sgt. C. E. Jones; F/O. V. L. B. Jones; P/O. H. E. Jupp; Act. Flt. Lt. L. J. Kingwell; Sgt. G. E. Knight; Sgt. K. Linford; Sgt. P. Mallon; Sgt. M. H. Messenger; P/O. R. G. Messer; Flt. Sgt. H. H. W. Middleton; Sgt. W. Neil; Sgt. D. W. Newbury; F/O. F. J. Nixon; Sgt. E. E. Olive; Sgt. H. W. J. Pain; Sgt. T. F. Quine; Sgt. L. W. Roberts; Sgt. F. W. C. Robertson; P/O. L. R. St. J. Scott; Flt. Sgt. F. A. Sturgess; Flt. Sgt. H. J. Sullivan; Sgt. J. A. Swingler; Sgt. H. Taylor; Sgt. K. W. Tindall; Sgt. J. D. Topple; Sgt. P. A. Turner; Sgt. C. G. Virgo; F/O. E. M. Wells; Sgt. H. M. Whitchelow; Sgt. D. F. D. Wilder; Sgt. T. Winn.

KILLED ON ACTIVE SERVICE.—Sgt. F. N. Bower; Sgt. M. A. Bowles; A/C.2 P. H. Fricker; A/C.2 J. W. Harding; Sgt. P. D.

LEARNING THE GRIFFON: Fleet Air Arm ratings assist in the overhaul of a Spitfire XII during combined operation exercises.

The crest of No. 57 Squadron R.A.F. "Corpus Non Animum Muto" (I change my body but not my spirit).

Izzard; Sgt. C. T. James; F/O. G. W. Mander, D.F.C.; P/O. E. T. Mason; Sgt. L. Thompson; L.A/C. G. A. Vose; Sgt. K. Walmsley; L.A/C. R. H. Watt; L.A/C. N. A. T. Wright.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. W. L. Haslam; P/O. R. C. Parkinson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. H. Rawlins.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Cpl. H. S. Hyslop.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. T. C. Banister; Sgt. S. Ford; L.A/C. D. W. Ross.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. W. Bodsworth.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. O. Ramsay; Sgt. C. F. Saville.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. A. F. Betteridge; W/O. I. T. D. Carnie; Flt. Sgt. B. K. Conroy; Flt. Sgt. D. A. Dunn; Sgt. E. O. Gregory; F/O. E. S. Murphy; W/O. K. S. Wedgewood.

MISSING, BELIEVED KILLED IN ACTION.—P/O. K. O. Barnes.

MISSING.—F/O. W. T. C. Edginton; Flt. Sgt. R. C. Ferguson; W/O. H. S. Fidge; F/O. G. B. Hoddle; Flt. Sgt. C. B. Hopgood; F/O. C. J. Johnson; Flt. Sgt. F. T. Langley; P/O. K. H. McKnight; Flt. Sgt. J. McLeod; Flt. Sgt. W. J. Martin; Flt. Sgt. S. J. Nelson; P/O. H. R. Stuchbury; Flt. Sgt. E. D. Turpie; Flt. Sgt. J. W. Wood.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. W. McL. Renwick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. L. R. Anderson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. G. Steinberg.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. Dixon; F/O. J. A. Frampton; W/O. J. T. Hill; Sgt. K. Smith; Flt. Sgt. J. A. Wheeler.

MISSING.—W/O. J. J. Astles; Sgt. K. H. Bennett; Flt. Sgt. J. G. Burke; Flt. Sgt. D. J. V. Dawson; W/O. J. D. Dodding; F/O. L. B. Fincham; P/O. D. H. Johasson; Sgt. H. F. Kelter; W/O. E. F. McAneeley; P/O. J. P. McKenzie; Sgt. L. R. Martin; W/O. O. L. Morrison; F/O. D. O. Olsvik; Sgt. J. P. F. Richard; W/O. T. R. Swinton; Sgt. J. A. G. Taillon; W/O. W. R. Tobin; P/O. R. L. Warren; F/O. W. S. Wilson.

KILLED ON ACTIVE SERVICE.—Flt. Lt. O. R. Alexander; Sgt. S. A. Carr; P/O. J. Cosoff; Flt. Sgt. J. J. Farrell; F/O. R. W. Grosser; Sgt. L. A. Hebenton; Flt. Sgt. L. I. Hogan; Flt. Sgt. F. W. MacDonald; Sgt. C. J. Whyte.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. G. H. Fleming.

Royal New Zealand Air Force

KILLED ON ACTIVE SERVICE.—F/O. M. J. Taylor.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. F. Simpson.

Members of the R.O.C. are asked to volunteer for duty with the merchant navy. All men of the Corps, whether whole or part-time, may volunteer. A shoulder flash "Seaborne" will be worn.

RANGE AND PUNCH: A 500 lb. bomb in the streamlined wing-rack of a Thunderbolt. For ultra-long-range, fuel tanks can be substituted for the bombs.

Casualty Communiqué No. 384.

Of the names in this list 149 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. H. Addinall; Sgt. W. J. Barber; Sgt. E. J. Brown; Sgt. C. Dove; Sgt. A. C. Goss; Sgt. D. V. Humberstone; P/O. G. Kay; P/O. W. King; Sgt. D. Kirkwood; Sgt. G. E. Smith; Flt. Sgt. J. E. Wintle.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. N. Allen; Sgt. J. H. Arlow; Sgt. J. Avery; Sgt. J. Atkinson; F/O. J. B. G. Bailey, D.F.C.; Sgt. A. L. Baseley; Sgt. A. R. D. Bedbrock; Sgt. H. A. J. Berry; Sgt. G. B. Buchan; Sgt. D. W. B. Channing; Sgt. R. G. Cooper; Sgt. A. Coull; P/O. L. W. Curtis; Sgt. R. H. Day; Sgt. A. C. Dean; Sgt. F. C. Dryden; Sgt. R. H. G. Ellis; Sgt. H. E. Elphick; Sgt. P. E. C. Flood; Sgt. D. C. H. Fudge; F/O. P. J. Gladman; Sgt. Z. Goldfinger; Flt. Sgt. R. W. Golloghy; Sgt. T. I. Goodwin; Sgt. E. Gough; Sgt. E. R. H. Griffiths; Sgt. J. R. Harrison; Sgt. J. R. Hayle; Sgt. E. G. Hird; Sgt. R. Hollas; Sgt. N. T. Holmes; Flt. Sgt. S. Jebson; Flt. Sgt. S. G. Jellis; Sgt. R. A. Johnson; Sgt. A. D. Johnstone; Group Capt. R. C. Jordan; Flt. Sgt. W. B. Julian; F/O. D. L. P. Justice; Sgt. J. K. Keele; Sgt. H. E. Kilburn; P/O. N. F. Lester; Sgt. I. Llewellyn; P/O. J. Lowrie; F/O. D. H. Lyne; Sgt. R. McKeag; Flt. Sgt. I. N. McLaren; Flt. Sgt. C. L. Mallett, D.F.M.; Sgt. R. L. Measor; P/O. F. G. Metcalfe; P/O. J. H. Miller; Sgt. A. T. J. Murray; Sgt. W. G. Mycock; Sgt. T. A. Owen; Sgt. A. H. Peadon; Sgt. A. R. Pearce; Sgt. A. J. Phillips; Sgt. B. L. Pottage; Sgt. J. Priestley; Sgt. J. H. Pritchard; F/O. D. J. Prytherch; Sgt. B. G. Radbourn; F/O. E. G. Redman, D.F.C.; Sgt. A. A. Reeves; Act. Flt. Lt. D. H. Reid; F/O. W. H. Richards; Flt. Sgt. E. T. S. Rowbottom; Sgt. F. H. Shaw; Sgt. J. T. Smith; Sgt. K. W. Smith; Sgt. C. C. Soang; Sgt. G. W. S. Spriggs; Sgt. J. Stretton; F/O. J. A. Thompson; Sgt. D. F. O. Turner; Sgt. A. E. Tytherleigh; Sgt. J. H. Uden; Sgt. E. C. Waite; Sgt. J. J. Walker; Sgt. J. W. Waring; Sgt. V. H. J. Watkins; Flt. Sgt. C. H. West; Sgt. W. J. Williams; Sgt. W. P. Williams; Sgt. C. Young

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. H. R. Cronchey; Sgt. E. J. Wilson.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. L. Bones; Act. Flt. Lt. C. Bush; Flt. Sgt. G. C. Clark; Flt. Sgt. J. C. Dalzell; Flt. Sgt. D. A. Dawson; W/O. J. W. Gibb; Sgt. R. F. Hawker; P/O. A. D. Johnson; Flt. Sgt. K. Knight; Sgt. N. F. Lingley; Flt. Sgt. C. E. Pearson; Sgt. R. P. Rees; Flt. Sgt. A. B. Sammons; Act. Sqn. Ldr. A. D. Saunders; Sgt. A. T. Sinclair; Sgt. A. Spence; Act. Flt. Lt. E. Stead; Sgt. J. L. P. Taylor; Sgt. J. Torrance; Sgt. A. Trivett; P/O. W. B. Yates.

MISSING.—Sgt. B. H. J. Baldwin; Sgt. A. E. Bennett; Sgt. R. S. Bettridge; F/O. H. F. Blackman; Act. Flt. Lt. J. Bowen; Act. Flt. Sgt. N. C. Bowker; Flt. Sgt. M. E. Bridewell; Sgt. T. A. Brown; Sgt. F. W. Burdet; Sgt. J. Cairns; Flt. Sgt. J. Campbell; Sgt. G. A. Cartwright; P/O. J. J. R. Clark; Sgt. B. Cohen; Flt. Sgt. A. I. Corlett; Sgt. N. Docherty; Sgt. J. Dove; Sgt. T. R. Evans; Sgt. D. C. Everett; P/O. T. B. Field; Sgt. E. Gedge; Flt. Sgt. P. A. Gilfeather; Sgt. T. H. Girven; P/O. J. W. Golightly; Sgt. E. S. Goodridge; F/O. C. D. Gough, D.F.C.; Sgt. J. V. Gwynne; Sgt. J. R. Hamilton; P/O. W. Henry; Flt. Sgt. M. Hepworth; Sgt. C. M. Hill; Sgt. E. Hopcraft; Flt. Sgt. E. A. Howe; Sgt. C. Howes; Sgt. C. A. Hughes; Sgt. H. W. Hughes; Sgt. T. J. Hynes; Flt. Sgt. J. D. McD. Jarvis; Sgt. D. Kenny; Sgt. W. Lannigan; Sgt. J. Marshall; Flt. Sgt. C. H. Maxted; Sgt. A. C. G. Merces; Sgt. J. T. Morey; Flt. Sgt. R. S. W. Morris; P/O. J. W. Morris; Sgt. H. J. Newey; Act. Sqn. Ldr. T. R. Nixon, D.F.M.; Sgt. W. Oliver; Sgt. H. C. Parker; Sgt. G. I. Paterson; Sgt. R. Prankett; F/O. R. L. Reeves; Sgt. S. W. Ricketts; Sgt. J. Richardson; Sgt. S. P. Rogers; Sgt. R. A. J. Rudge; Sgt. K. F. Scammell; Act. W/O. R. Stanners; P/O. J. W. Taylor; Flt. Sgt. K. R. Tidmarsh; Flt. Sgt. G. W. Traylor; Sgt. F. B. Vallance; Sgt. G. Wheeler; Sgt. H. G. Williams; Sgt. R. L. Woodhouse.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. L. Snart.

DIED ON ACTIVE SERVICE.—A/C.2 A. Hardy; L.A/C. F. M. M. Reid; L.A/C. E. J. Rogers; A/C.2 C. Walthall.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—Sgt. W. A. J. Manser.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. A. R. Head, A.F.C.; Sgt. J. B. Shand; P/O. J. E. Thomas, D.F.C.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. F. A. Preston; P/O. W. L. Topp.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. A. B. R. Airy; P/O. J. T. Buchanan; Flt. Sgt. K. R. Clarke; W/O. A. D. Finlayson, D.F.M.; Flt. Sgt. F. E. Gee; Flt. Sgt. E. H. Gunders; Flt. Sgt. A. A. Harlem; P/O. W. H. Moore; P/O. T. R. Odger; P/O. A. N. Vidler.

MISSING, BELIEVED KILLED IN ACTION.—Act. Flt. Lt. W. J. Dorner, D.F.M.

MISSING.—Flt. Sgt. J. Daley; F/O. A. W. Dawe; P/O. K. G. McAlpine; W/O. J. Rowe; Flt. Sgt. J. A. Siebert; Flt. Sgt. L. J. Stephens; Flt. Sgt. R. D. Williams.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. D. G. Bird; P/O. J. C. Bradley; F/O. R. B. Brown; Flt. Sgt. D. E. Campbell; W/O. L. J. Davidson; W/O. H. S. Fawns; F/O. J. R. G. Gingras; F/O. S. W. Handforth; Flt. Sgt. J. Hanna; F/O. C. C. Hebden; Flt. Sgt. C. V. Howden; F/O. A. Ittkin; Flt. Sgt. H. K. Kells; P/O. L. W. Kerr; Sgt. L. R. Lamoure; P/O. F. H. Leaver; F/O. A. J. Middleton; Sgt. W. G. Parkinson; Flt. Sgt. C. W. Pickering; Flt. Sgt. J. D. Pigeau; Sgt. H. A. Queen; Sgt. A. S. Rhodes; F/O. G. C. Silver; Flt. Lt. A. E. Spurr; F/O. H. C. Treherne; Flt. Sgt. R. Urquhart; P/O. S. G. Young.

MISSING, BELIEVED KILLED IN ACTION.—P/O. K. G. Cummings; W/O. J. W. Gibbons; W/O. P. A. McIntyre; Sgt. J. McIvor; Flt. Sgt. H. R. McKay; F/O. J. V. Pearl; Sgt. V. E. Reed; Flt. Sgt. D. Sinclair; Flt. Lt. J. J. Stephen; Flt. Lt. W. M. Sterns, D.F.C.

MISSING.—W/O. J. F. Allen; W/O. F. R. Alleyn; W/O. W. S. Ball; P/O. H. D. Beames; F/O. C. McN. Broadfoot; Sgt. T. J. Brewer; F/O. P. C. Cox; W/O. F. Davenport; W/O. J. W. Donnelly; Sgt. E. A. Dowe; W/O. W. W. Duncan; P/O. A. C. Forsyth; F/O. H. A. Hancock; Sgt. G. C. Hatch; F/O. W. D. Hawter; Sgt. R. G. Jennings; F/O. E. J. C. Krynkow; Sgt. L. T. Linton; Sgt. R. E. McGregor; W/O. M. A. McKenzie; W/O. J. May; W/O. L. R. J. Meech; Flt. Sgt. A. F. Moore; Flt. Sgt. T. J. Moran; F/O. C. L. Murray; Flt. Sgt. C. B. Murray; Sgt. A. G. Pearce; F/O. M. J. Reid; Sgt. M. R. Smoke; Flt. Sgt. J. W. Torscher; Sgt. V. G. Whalen; F/O. M. Yowney; Flt. Sgt. E. G. Waterston; Sgt. W. Plunkett; W/O. J. S. Tames.

SERVICE AVIATION

DIED ON ACTIVE SERVICE.—Flt. Lt. W. H. Hughes.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. S. W. Bryant; Sgt. J. E. James; Sgt. N. McBride; Flt. Sgt. R. H. Vance.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. N. K. P. Hickson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. L. Hendry; Flt. Sgt. G. F. Langham; Flt. Sgt. B. T. F. Parker; Flt. Sgt. D. F. Scott; Flt. Sgt. T. T. R. Tomoana.

MISSING.—P/O. F. B. Pirani.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Air Sgt. A. L. Baikie; Air Sgt. J. H. Brits; 2/Lt. A. J. Case; Lt. F. W. Friedmann; Flt. Sgt. N. W. Hicks.

Casualty Communiqué No. 385.

Of the names in this list, 104 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. Davis; Sgt. A. Flower; Sgt. G. H. Jackson; Sgt. W. Kidd; Sgt. C. H. Macaulay; P/O. K. W. McTernaghan; Sgt. J. F. Maxwell; P/O. S. Norris; P/O. R. S. Payne; Sgt. D. J. Purcell; P/O. F. R. Sanderson; F/O. T. H. Tabberer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. W. H. Bolam; Sgt. T. Campbell; Sgt. J. S. Clenton; Sgt. E. W. Edwards; Sgt. C. P. Ellins; Sgt. V. Eyton-Jones; Sgt. T. H. G. Francis; Sgt. H. Gardner; Sgt. R. F. Garside; Sgt. W. E. Goodacre; Sgt. R. F. Grove; F/O. F. R. Haines; Sgt. J. McC. Helm; Sgt. E. J. Heywood; Sgt. J. E. Hoey; Sgt. J. B. J. Hook; Sgt. W. H. Horrigan; Sgt. E. J. Howitt; F/O. W. D. Joy; Sgt. E. Kent; Sgt. F. C. R. Knight; Sgt. J. P. McGarry, C.G.M.; P/O. D. MacKenzie; Flt. Sgt. F. D. McQuillan; Sgt. R. Mailey; Sgt. F. Mellor; Sgt. P. M. B. Moody; Sgt. F. W. Morrell; Sgt. J. R. Nicholls; Sgt. G. H. Peel; Sgt. R. Pugh; P/O. A. A. Robertson; F/O. I. H. Robertson; Sgt. A. F. Saunders; F/O. R. R. Shadbolt, D.F.C.; Sgt. T. Silcock; Flt. Sgt. D. W. Sloggett; Sgt. G. A. Smith; Sgt. H. W. C. Wheeler; F/O. J. C. White; Sgt. M. Wood.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. W. Dench; P/O. R. J. Herbert; F/O. H. E. Kessock Philip; Sgt. J. Richardson.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. K. L. Rabson.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. H. Bell; Flt. Sgt. G. Bewsher; P/O. G. A. Brown; F/O. R. W. W. Coggins; F/O. W. M. Davies; Flt. Sgt. W. J. Donaldson; Act. Flt. Lt. J. D. Ramsay.

MISSING.—Sgt. K. Allen; Sgt. W. E. Allen; Flt. Lt. R. E. Allitt, D.F.C.; P/O. J. Armstrong; Sgt. L. C. Barrett; W/O. T. A. Beatey; Flt. Sgt. L. A. Bolt; F/O. D. P. Bowie; Sgt. T. B. Boyd; Sgt. J. W. Brown; F/O. G. H. E. Buckley; P/O. C. T. Burrows; Sgt. R. E. Burt; Sgt. R. H. Cantwell; Flt. Sgt. M. Churchman; Sgt. J. Clark; Sgt. G. T. Clouter; Flt. Sgt. A. M. Cook; Flt. Lt. C. B. P. Davies; Sgt. W. N. Ebsworth; Sgt. P. H. Edwards; Sgt. T. Finnerty; Sgt. W. K. Fletcher; Sgt. T. H. A. Forster; Act. Flt. Lt. F. J. Fraser; Sgt. S. H. Geake; Sgt. T. Gettings; Flt. Sgt. F. S. Godden; P/O. C. W. G. Graham; Flt. Sgt. H. F. Grinnell; Sgt. J. J. Hanley; Sgt. S. Hayes; Flt. Lt. T. W. R. Healy; F/O. O. D. Hill; Act. Flt. Lt. R. D. Houghton; Sgt. E. MacP. Howard; Sgt. F. J. Huxen; Sgt. J. Jones; Sqn. Ldr. T. S. R. King; Flt. Sgt. A. J. Kirk; Flt. Sgt. W. Kitson; Flt. Sgt. W. A. Lampkin; F/O. I. L. Land; P/O. P. H. J. Mackie; Flt. Sgt. A. C. J. Mango; Sgt. W. Moores; Sgt. D. N. Murphy; Flt. Sgt. D. Nelson; Flt Sgt. E. H. Parsey; Sgt. H. F. Payne; Flt. Sgt. D. J. E. Poole; Flt. Sgt. H. A. Richardson; Sgt. J. Robertson; Sgt. J. N. Schofield; F/O. M. H. Shelton; Sgt. C. H. Simpson; Sgt. H. S. Slow; Flt. Sgt. R. L. Smith; Flt. Sgt. T. C. Squance; F/O. R. D. Sullivan; P/O. C. A. Tidy; F/O. C. Timson; Sgt. A. Tym; Flt. Lt. L. W. G. Ward; Sgt. C. R. West; Flt. Sgt. W. F. Williams; Sgt. R. W. Wood; Sgt. S. T. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. J. Bull; Sgt. R. C. Cox; F/O. E. G. Rapkin.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. G. G. Ackerman; Sgt. D. S. Allen; F/O. W. Beckensall; Sgt. G. H. Bodsworth; F/O. S. Burton; Sgt. D. C. Clarke; L.A/C. J. R. Durston; Sgt. W. N. Farrell; Sgt. A. Forsyth; L.A/C. W. B. Forsyth; Sgt. A. Fox; L.A/C. A. C. M. Green; Sgt. H. W. Green; Sgt D. R. W. Hall; Sgt. J. W. Henderson; Act. Sgt. P. Howarth; Flt. Lt. C. H. L. James; Flt. Sgt. C. A. V. Jefferys; L.A/C. B. H. M. Jones; Flt. Sgt. D. Jones; Sgt. G. G. Lester; Sgt. J. MacMillan-Clark; Flt. Sgt. W. H. Mann; Sgt. G. R. Marshall; Sgt. A. W. Mills; Sgt. W. H. Muddell; W/O. E. G. Parkes; Sgt. C. F. Prentice; Sgt. N. V. Prior; W/O. L. Roper; Sgt. H. Russon; F/O. K. G. D. Shipway-Fowler; Sgt. N. Simpson; Flt. Sgt. F. E. Slade; Sgt. D. St. Clair; Sgt. P. A. Street; Sgt. R. G. Williams; Sgt. J. C. Willis; Sgt. L. F. Woods.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. W. Hetherington.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Act. Sgt. W. R. Campbell; P/O. J. V. Ludgrove; Flt. Sgt. R. J. Powell.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. F. Cheney.

DIED ON ACTIVE SERVICE.—W/O. G. W. W. Baker, M.B.E.; L.A/C. A. C. Bond; Sgt. J. A. Campbell; Cpl. R. W. Caunt; A/C.1 S. C. Cooper; L.A/C. D. R. Davies; A/C.2 J. Deegan; L.A/C. A. C. Doherty; F/O. F. Goddard; A/C.2 H. Harrison; Cpl. S. V. Hughes; A/C.1 A. T. L. Jones; A/C.2 R. Kerr; Act. Flt. Lt. J. A. Moy-Thomas; Cpl. J. H. Romer; A/C.1 J. R. Straughan; Cpl. A. F. Tomlinson; Wing Cdr. R. S. Topham, M.B., D.P.H., D.M.R.C.; Flt Lt. E. V. Turner; Cpl. J. Watt; Cpl. D. J. Williams; Sgt. P. Wright.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.1 E. P. Davies; L.A/CW. G. Peach

Royal Australian Air Force

KILLED IN ACTION.—F/O. W. G. Parkes.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. A. J. Birtles; Flt. Sgt. B. A. Kelly.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. J. Browne; Sgt. W. E. Bryden; Flt. Sgt. P. A. Fraser; Flt. Sgt. W. L. Jarvis; P/O. K. McK. White; P/O. R. W. Wildman.

MISSING.—Flt. Sgt. K. F. Allen; Flt. Sgt. G. R. Barker; Act. Flt. Lt. H. A. L. Ellis, D.F.C.; P/O. D. Fletcher; Flt. Sgt. T. King; Act. Flt. Lt. W. J. H. Love; Flt. Sgt. P. F. McCaughey; Flt. Sgt. T. G. D. Mills; W/O. O. H. Padman; Flt. Sgt. B. E. Rawlings; P/O. W. S. Watson.

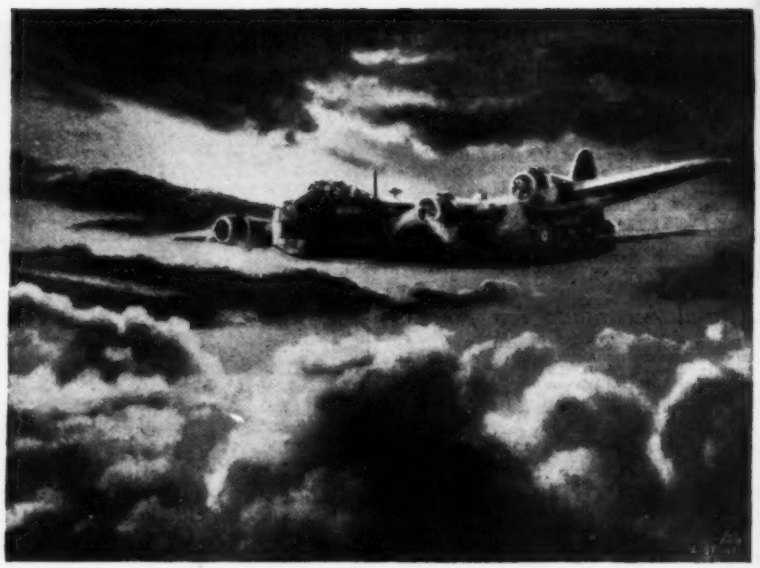
MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. J. L. Gilbert.

KILLED ON ACTIVE SERVICE.—P/O. C. C. Bradley; Flt. Sgt. G. M. Crouch; Flt. Sgt. A. H. Moss; Flt. Sgt. A. W. O'Brien; F/O. I. D. Sheekey; P/O. G. N. Smith; W/O. J. M. Tew.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. G. R. Canfield; F/O. E. O. Hillman; F/O. C. D. Johnston.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. T. Hamer; F/O. H. G. Handley; F/O. J. A. MacT. McLeish; F/O. K. R. Waters.



Study of a moonlit Stirling by L. W. Stonell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. Andrews; Sgt. G. A. D. Cameron; F/O. D. A. Carmichael; F/O. O. M. Cornish; F/O. G. K. Crummy; F/O. G. Davidson; Flt. Sgt. H. L. Davis; Flt. Sgt. A. W. Dickison; Flt. Sgt. L. A. Ferguson; Sgt. J. R. Grasley; F/O. P. J. Greig; F/O. A. R. Herron; P/O. W. R. L. Horne; Flt. Sgt. D. L. Jarrett; L.A/C. J. B. Leitch; F/O. L. F. Lown; F/O. J. D. MacFarlane; P/O. F. C. McWilliams; F/O. J. B. Mann; Sgt. J. C. Nicol; P/O. H. A. Partridge; F/O. W. A. Rollings; Flt. Sgt. M. Trevale; Flt. Sgt. G. L. Tucker; F/O. G. T. Vicary; Sgt. J. K. Wood; P/O. M. Zeavin.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. M. G. Petz.

WOUNDED OR INJURED IN ACTION.—F/O. W. J. Hartrick; F/O. P. R. Rackham.

MISSING BELIEVED KILLED IN ACTION.—F/O. C. F. Bull; W/O. F. L. P. Cains; F/O. L. J. Yeats.

MISSING.—Sgt. W. L. Alder; Flt. Sgt. J. L. Beattie; Sgt. A. H. Hackbart; Sgt. M. B. Lebolduc; Sgt. D. C. Lewthwaite; F/O. H. W. Linscott; P/O. D. K. McLeod; Flt. Sgt. E. W. O'Donnell; F/O. R. W. Offler; F/O. J. R. Piper.

KILLED ON ACTIVE SERVICE.—F/O. E. G. Bayer.

DIED ON ACTIVE SERVICE.—Cpl. S. G. Harfitt.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. L. J. Kirkpatrick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. V. T. Parkin; F/O. H. P. Sands; Flt. Sgt. T. Watters; Flt. Sgt. J. G. Wilson.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. D. Moultrie.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. Anderson; P/O. E. J. Patterson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. C. A. Harris; Flt. Sgt. J. E. Ilyde.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Act. Sgt. J. D. Dickin.

MISSING.—Maj. J. E. Bell; Lt. E. E. Sisson; Lt. N. H. M. Stead.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Act. Flt. Sgt. P. J. Joubery; Lt. G. P. Kriel; W/O. W. J. Layed; Sgt. R. W. Martin; 2/Lt. H. Rowson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L. G. Aylwin.

Indian Air Force

MISSING.—F/O. S. Merriman.

Official Correction

Casualty Communiqué No. 382.

R.C.A.F., under "KILLED ON ACTIVE SERVICE." for Flt. Sgt. C. A. SIMPSON, read W/O. C. A. SIMPSON.